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THE A.V.A. CONVENTION

The 11th annual convention of the American Vocational Association will be held at San Antonio, Texas, December 2, 3, 4, and 5, 1936.

San Antonio, the convention city, alone is worth visiting. Of more importance to the teacher of industrial arts and vocational education, of course, are the subjects to be discussed at the convention. Nevertheless, the historical interest of the convention city is not to be overlooked.

The many national educational problems which present-day conditions have brought up will be matters for discussion. Every shop teacher is vitally involved in the solution of these problems; everyone ought to be present at this important national convention. Industrial arts, trade and industrial education, vocational guidance, teacher training, all will have their innings. Be sure to attend.

OTHER CONVENTIONS WHICH WILL BE HELD

November 5–7, Iowa Vocational Association, Des Moines, Iowa.

November 5–6, Wisconsin Industrial Arts Association and Wisconsin Vocational Association, Milwaukee, Wis.

November 23–25, Industrial Arts Round Table, Rapid City, S. Dak.

November 27–28, Virginia Vocational Association, Richmond, Va.

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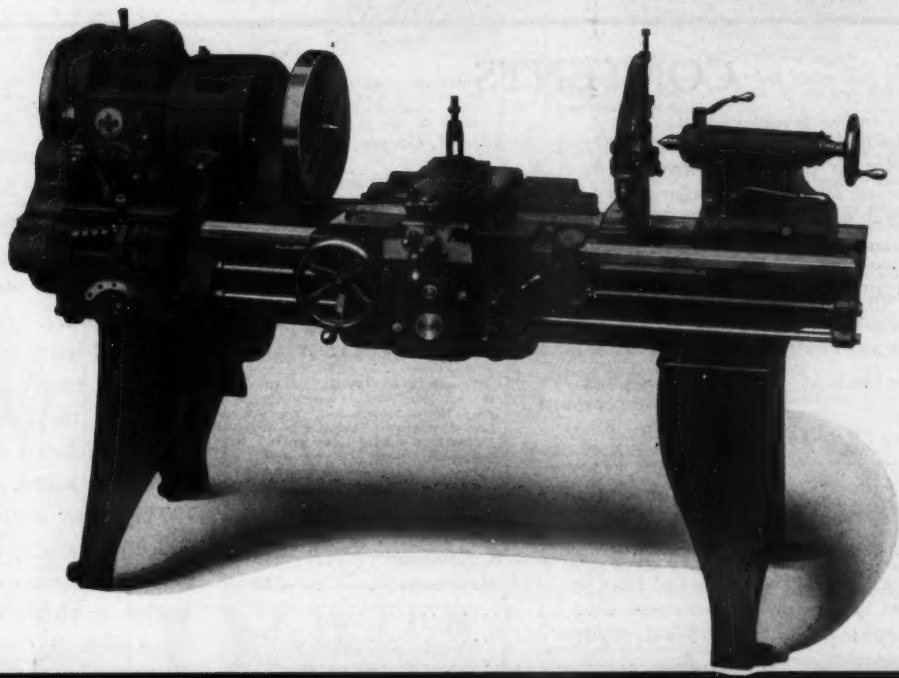

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November, 1936
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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Stimulating Interest in the Home Workshop

Allen A. Cooper

Roosevelt Junior High School, St. Joseph, Missouri

A fifteen-point program for stimulating interest in the home shop.

Due to the increased amount of leisure time that is and will be confronting the youth of America today, there is a definite need for the institution of *home workshops*. This demand will come from the parents and pupils of your schools and should be encouraged in every way by the teacher in charge. There is no use to delve into the reasons for the home workshop as the readers of this article are familiar with its virtue and advantages. I would, however, like to present some factors that I think will prove valuable in helping out this movement.

1. Get the administrative heads of your school system interested and in sympathy with the movement.

No matter how important the movement is, it will fail to gain impetus or popularity without the support of the principal or superintendent in charge. His indorsement will go a long way toward its success and final achievement.

2. Get the other teachers of your school interested in the home workshop and in sympathy with the movement.

The principal or the superintendent can be spoken of in terms of leadership and even if they are favorable to home workshops, the movement may fail without the hearty support of the faculty members and your co-workers. They have more or less influence on those pupils and parents that happen to come under their sponsorship. Adverse words spoken by another teacher may undo all that you might have been able to build up over a long period of time. It is always better to have your faculty co-workers on your side.

3. Invite "Dads" to your shop and get them interested.

The play spirit lives on and on. Men are merely grown-up boys with more advanced ideas, sobered and stimulated by life's experiences and hard knocks. Men still like to "play" and experiment with the unknown the same as do boys. If a pupil shows enough enthusiasm, he can usually interest his dad and the result is, if finances permit, a home workshop. Never overlook the opportunity to interest the fathers of your pupils. Invite them in to see where "junior" works, how he does things, and what he would gain if he had a shop of his own at home.

4. Help the pupil plan his workshop as a school project.

I can think of nothing finer for a pupil to work on in industrial arts than plans for his own workshop at home. He is not only building the correct attitudes and habits while doing so, but he also is creating something that he will be able to use for many years to come. He is creating a haven of enjoyment, a retreat from the monotony of "time on his hands." The teacher is well qualified to give suggestions on this subject, as he has had both experience and professional training on the placement of fixtures and machines so as to utilize the lighting facilities to the best advantage. He can advise as to ventilation, safety measures, arrangement of hand tools, disposal of waste, etc. A complete layout of the prospective home workshop may be made by the student as a project in industrial arts.

5. Have a number of blueprints and home-workshop plans handy to lend out when they are desired.

It is very gratifying to the student to find a blueprint or plan available for the thing that he desires to make. It is also very much appreciated by that student to know that the teacher will lend those plans to him for use until he is done with them. It should be understood, however, that the student is to return these plans when he has finished with them.

6. The simpler equipment in the shop could be "shop-made" as much as possible in order to give the pupils ideas about making their own equipment for their home workshops.

The first impression is the greatest, we are told. The first impression that most of these youngsters have of a workshop is the industrial-arts shop in the school to which they are sent. If the shop teacher shows that even for school use, at least some of the simpler equipment and fixtures can be made at a very nominal cost, the student cannot help but be impressed. Otherwise, he may think that the cost of starting a home shop will forever be beyond his own pocketbook.

7. Let students start projects in the school shop and finish them at home provided they have satisfactory working conditions for successfully completing them there.

Most boys, especially of the junior-high-school age, are in a hurry to complete anything that they start. A job, no matter of what nature, if it is interesting to them and they are eagerly giving their efforts to its successful completion may become boresome and monotonous if it is strung out over a long period of time. The student wants to finish it as soon as possible. Besides giving him the chance to complete his task sooner, working at home on it gives him the chance of spending his leisure time at a worth-while enterprise under wholesome environmental factors and amid desirable associates. He can more clearly visualize the connection between his school and his home life. This in turn, reacts and enriches the school's program.

8. Keep a sharp lookout for second-hand tools that are for sale and inform prospective students where they can buy them.

Ninety-nine fathers out of a hundred will recognize and take advantage of their sons' inclination toward having

a home workshop. They will appreciate any effort that the teacher may make toward finding tools and equipment that might be useful in the homeshop.

9. Any broken shop equipment may be given to worthy pupils to repair and use in the home workshop.

Broken or discarded equipment or tools that are lying about the shop may be given to pupils to repair and use instead of throwing them away. A teacher sometimes cannot realize how much a young fellow would appreciate these things. Besides, it gives the boy valuable training in the utilization of old materials, not only from the standpoint of economy, but from the standpoint of appreciation and how to care for the things we buy or use. The virtue of being an intelligent consumer is just as valuable as being an efficient producer.

10. Stimulate an annual exhibit of "homeshop-made" projects and a model home workshop that is set up and working.

A couple of years ago at the annual meeting of the Missouri State Teachers Association, the Kansas City, Mo., industrial-arts teachers placed a very fine exhibit in the auditorium of the Lathrop Trade School. Among other interesting features of the exhibit was a complete home workshop fenced off into a unit by itself and in operation. Each machine had an operator who was occupied on some project or task. It gave the spectator a very vivid picture of what his basement or garage *could* look like should he put forth a little effort and expenditure. Besides the shop in action, many of the articles that had been made in the homeshops, were on exhibit, giving people some idea of what can be done.

11. Stimulate a homeshop or craftsman club that can meet periodically at the workshops of its different members.

A group of people interested in the same things, and who can meet at some specific place and time can readily be formed into a club. This surely is true of boys interested in home workshops. The natural time to meet would be evenings, and the appropriate place would be at the different shops of those who comprise the membership of the club. Meeting thus is very valuable, as it helps the members to *swap ideas* and to discuss current topics that are of interest to all. Certain features of one fellow's shop also may suggest changes or additions in the shops of other members.

12. Work with the pupils that are most interested and don't waste time on the pupils who are indifferent to the proposition.

A teacher cannot afford to spend valuable time trying to get some disinterested pupil converted while he may spend that same time with those who are interested and will achieve some results.

13. Visit the home workshops evenings and supervise by giving suggestions, help, etc.

Do not make any visits until invited. Your presence in the home workshop will greatly help you to tie up the school with the home in such an intimate manner that it will be hard for the student to distinguish where the line of demarcation really is. In making these visits, it is best to go pretty early, as most young people will not work late unless on a rush job. Give any suggestions that you may think will be of benefit to him and point out the good points of his shop that he has already instituted. Praise him where praise is deserving and constructively criticize where it is necessary. Point out some "tricks of the trade" that his equipment and machines will do that he did not know they would do, thereby increasing the efficiency of his workshop.

14. Try to get the YMCA, YWCA, Salvation Army, and similar organizations to install workshops in their buildings.

There are no better places for erecting home workshops than at the headquarters of some of these organizations. So many things may be made by those who frequent these gathering places, and so much pleasure may be gained by them while acquiring an interesting hobby which will keep them out of the drink parlors, pool halls, and other similar retreats.

15. Get as much publicity as possible through local publications and newspapers.

A great many people may know about the home-workshop movement and a large percentage of those may have them, but it never harms anyone to have a larger number of people know about it and be in sympathy with it. The newsstaff photographer can take pictures of different home workshops and put them in the local newspaper together with a write-up. Pictures of exhibits and individual jobs also may be written up.

No matter how valid the scheme seems to be, there are always pitfalls along the way and some well-meaning teacher might unwittingly trip over these barriers. It is well, therefore, to observe the following *Don'ts* which might otherwise lead to grief, trouble, and loss.

1. Don't give school credit for work done at home.

2. Don't lend out school tools and equipment for use in the home workshops.

3. Don't force any pupil to start a home workshop. The demand should come from the pupil or his parents, not from the teacher.

4. Don't involve yourself financially in any pupil's workshop enterprise.

5. Don't attempt to supervise too many home workshops at one time. Use your own judgment about the number to attempt.

Providing for Individual Differences

F. R. Kepler

Supervisor Mechanical Drawing, Detroit, Michigan

Helping the boy evaluate and adjust himself in the mechanical-drawing class.

The problem of individual differences among the students in any class is well recognized. Whenever drawing-room work is to be organized effectively, provision must be made for such differences by individualizing the instruction. Individualized instruction implies that the instructional material and the instruction itself is to be suited to the individual's aptitudes, interests, experiences, and abilities. In practice it is not possible to prepare instructional material for each individual in the class. The material, therefore, is designed as nearly as possible for homogeneous groups. Ordinarily three or four levels of lesson material and requirements will meet the situation very nicely.

The successful teacher helps his pupils find a need for the work undertaken and makes the work interesting by relating it to life situations, to human

interests, to natural impulses, and to acquired experiences and ideals. To obtain wholehearted interest and consequent effort, an opportunity is offered the pupil to select his own problem, to understand what the task is, and the requirements which are necessary to earn an equitable grading of his work. By choosing his problem and accepting the conditions, the pupil receives his reward as much for the way in which he works and solves his problem as for his technique.

In many of the intermediate (junior high) schools of Detroit, the plan outlined herein has been in use for several semesters, with a considerable degree of success.

Some of the advantages of the plan are: (*a*) resemblance to a life situation; (*b*) with adolescent boys it becomes a sort of game; (*c*) the student accepts the responsibility of choosing and doing the character of work he selects and the consequent reward; (*d*) the pupil understands the requirements for the class of work and the basis of reward; and (*e*) it provides opportunity to above-the-average pupil to choose the more challenging problems and to supplement his drawing with interesting related information.

An Introductory Lesson
Choosing the Kind of Worker to be in Mechanical Drawing

To help you to have a better understanding of what your work is to be like in mechanical drawing, you first should read carefully the two references which follow, and then the text that follows in this lesson.

References

McGee and Sturtevant, *General Mechanical Drawing:* "The Work of the Machine Draftsman," page 48; "Specialized Workers in Machine Drafting," page 52.

Choice of a Kind of Worker

Boys in mechanical-drawing classes may work as those who use mechanical drawing outside the drawing room. This means that you may choose to work as (1) an engineer, (2) a draftsman, or (3) a junior draftsman. Work in mechanical drawing will give you a better understanding of the uses of drawing. It will also find out whether you have any ability or real interest in any of the kinds of work where mechanical drawing is used.

As you study about the different kinds of workers try to think which kind of worker you would like to be in the mechanical-drawing class. Be careful to choose a kind of work which you think you can do best. It would be much better to try the kind which you are likely to do best than to choose harder work and fail to make good. You do not have to work as the same kind of worker in all lessons. You may start as a junior draftsman and later find that you can do better as a draftsman because it is more interesting. In that case it will be better to work as a draftsman or an engineer.

The following paragraphs tell about the work of the different kinds of workers:

Engineers

As an engineer you must plan and do your own work successfully with the least help from anyone else, and check it honestly. You must be able to make your drawings accurate in every way. They must be finished in the best possible manner, showing uniformity, contrast, and neat, uniform lettering. You must read the lesson and other books carefully and understand all about the drawing problem.

Engineers are willing to listen, and to learn from others, and work together helpfully. They like and want to work on problems that make them think. Real engineers like to work on plans for machines and buildings that will help make people happier and more comfortable. Engineers in class are able to check drawings and make reports. They will always do any tasks well that are given to them.

Drawings for engineers will be the most difficult to understand. They need the most thought and study.

Draftsmen

As a draftsman you must plan and go ahead with much of your own work and check it carefully with but little help from others. You must be able to follow brief directions and make drawings that are accurate and well done, with uniformity and contrast. The lettering must be neat and regular. You should understand the drawing itself thoroughly and know a great deal about anything that helps in an understanding of it. As a draftsman you will have to read the text in the lessons, to read the best references, to use simple handbooks, and to find all the needed information possible before asking questions.

A draftsman is able to think clearly about his job, to figure out his own problems, and to work in an orderly way. He wants to work with others and be helpful. To be promoted to an engineer, a draftsman must do well anything that he is given to do.

The drawings to be done by draftsmen will not be quite as hard as the ones for engineers. However, the quality of the work must be high.

Junior Draftsmen

As a junior draftsman, you will have to follow directions that are given by someone else, or that you will read. Your drawings must be complete and accurate, and must be of good quality. After they are checked you will often have to make changes. You may need a great deal of help in checking and grading your own work. You must have the necessary information to understand the drawing. As a junior draftsman you will find it necessary to read the lessons and the reference books often. When in doubt ask your teacher.

Junior draftsmen work with others gladly doing their full share of the tasks to be done. They make changes cheerfully when asked to do so. Junior draftsmen try hard to improve their work so that they may be promoted to draftsmen.

The drawings for junior draftsmen will not be as hard as for draftsmen, but the work and the finished drawings must be of good quality.

Machine Operators

As a machine operator you will follow directions. Others will plan and check the work. Drawings which are made by machine operators are usable but they may lack completeness and accuracy. An operator will be able to make the drawing and understand it well enough to find the size and shape of the object that it represents. You will find all the help you can in the lessons, but when you do not really understand, you are to ask questions.

Machine operators do many necessary things that have to be done. They are glad to work with others even in a small way. Most operators try hard and often work enough better to be promoted to the position of junior draftsman.

No one should choose to work as a machine operator without the teacher's counsel and consent.

In factories, the four kinds of workers are paid for the kind and importance of the work which they do. For example, an engineer is paid more than a draftsman, a draftsman more than a junior draftsman, and a junior draftsman more than an operator. There is a chance to work hard for a promotion and get higher pay. In a mechanical-drawing class you will not be paid in money, of course, but will be given A, B, C, or D.

In mechanical drawing, satisfactory growth in your skill, in the way you go to your work, and in how much you know about it will be marked accordingly. Generally those who make satisfactory growth as engineers are given an A, as draftsman, a B, as a junior draftsman, a C, as operators, a D. In each case, the letter is the highest mark for that kind of work. Work that shows growth that is not satisfactory will be given an E.

So that you will not be disappointed later, you must understand that you must meet all the conditions of your choice. If your growth has not been satisfactory your mark will be less.

Be sure to understand just how you are to work. Your teacher will give you a chance to talk about the different kinds of workers. Also talk about what these workers do and what they have to know with your classmates and others. You may be able to get some help from books and magazines. Study again what the workers who use mechanical drawing have to know and do, and ask questions if you do not understand. Finally choose the kind of worker that you wish to be. Your teacher will ask you to tell your choice.

Mechanical Drawing in Wisconsin

Harvey W. Waffle

High School,
Waukesha, Wisconsin

A survey of the teaching of mechanical drawing made by a committee of the Wisconsin Industrial Arts Association.

There is a wide variance of opinion among supervisors and teachers of mechanical drawing regarding the content of courses, types of courses taught, objectives, and allocation of school time for their work. In some courses, the drawing is centered around woodwork, while in others, machine-shop work furnishes the basis. Some teachers believe in mastery of one unit before proceeding to the next, while others favor a more general program based upon exploratory experience and with little emphasis upon technique.

A committee was appointed by the Wisconsin Industrial Arts Association, to study the teaching of drawing in Wisconsin. This committee was composed of the following men: Harvey W. Waffle, Instructor of Drawing, Waukesha, Wis., chairman; Roy R. VanDuzee, Supervisor of Industrial Arts, West Allis, Wis.; E. S. Lamoreaux, Instructor of Drawing, Janesville, Wis.; R. R. Bedtker, Instructor of Drawing, Wauwatosa, Wis.; Leo Ebben, Instructor of Industrial Arts, Kohler, Wis.; G. A. Todd, Instructor of Junior-High-School Drawing, Racine, Wis. A questionnaire was prepared and mailed to all drawing teachers listed in the Wisconsin Industrial-Arts Directory.

In analyzing the subject of drawing as taught in Wisconsin, one must first consider the problem from the standpoint of types of schools represented. In some of the smaller towns of the rural section one teacher teaches all shop subjects and the time is necessarily limited and general in nature. In the urban areas the high schools offer more specialized subjects, with a trend toward vocational training for those electing the subject in the upper grades of the senior high school. Besides these general types of schools, there are the technical high schools. In some schools teachers of drawing teach nothing else, in others they teach both drawing and other shop subjects.

Two hundred copies of this questionnaire study were sent out to the teachers of the state. Eighty-two were returned, representing a very good cross section considering the duplication of teachers within the same school system. The returns came from 52 cities out of a total of 143 listed in the directory. The cities from which returns were made are quite well distributed over the entire state.

Population	*Number of Cities*	*Number of Teachers Reporting*
Less than 2,500	12	12
2,500 to 10,000	21	21
10,000 to 25,000	11	14
More than 25,000	8	35

Of the number of schools reporting, 27 were junior high schools, 5 senior high schools and 50 were junior-senior combinations.

The lengths of the periods vary considerably. The 60-minute period seems to be the most favored, but this is closely followed by the 45-minute period. The number of meetings per week vary from one day per week to five, with all of the combinations between in the junior high school. Five

GEOGRAPHICAL DISTRIBUTION OF CITIES IN WISCONSIN

1. Antigo
2. Appleton
3. Ashland
4. Augusta
5. Baraboo
6. Beloit
7. Burlington
8. Delavan
9. Eagle River
10. Fort Atkinson
11. Fond du Lac
12. Goodman
13. Green Bay
14. Hurley
15. Janesville
16. Jefferson
17. Kenosha
18. Kohler
19. LaCrosse
20. Manitowoc
21. Marinette
22. Mayville
23. Menasha
24. Menomonee Falls
25. Merrill
26. Milwaukee
27. Nekoosa
28. Omro
29. Plymouth
30. Portage
31. Port Washington
32. Prairie du Chien
33. Racine
34. Reedsburg
35. Rhinelander
36. Rice Lake
37. Ripon
38. Shawano
39. Stevens Point
40. Two Rivers
41. Union Grove
42. Watertown
43. Waukesha
44. Wauwatosa
45. Waupun
46. Wausau
47. West Allis
48. West Bend
49. Whitewater
50. Wisconsin Rapids
51. Wonewoc
52. Menomonie

A STUDY OF THE TEACHING OF MECHANICAL DRAWING

WISCONSIN INDUSTRIAL ARTS ASSOCIATION

K. KNAPPLE — STUDY COMMITTEE CHAIRMAN

TYPES OF SCHOOLS STUDIED

JUNIOR HIGH SCHOOLS	SENIOR HIGH SCHOOLS	JUNIOR-SENIOR COMBINATION
▓▓▓▓▓▓	▓	▓▓▓▓▓▓▓▓▓▓

A. TIME

1. DO YOUR CLASSES MEET FOR A 60-MINUTE PERIOD? 45-MIN.? 90-MIN.?

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
60-MINUTE PERIOD	▓▓▓	▓▓▓	▓▓▓	▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓
90-MINUTE PERIOD	▓▓	▓	▓▓	▓	▓▓▓	▓▓	▓▓▓	▓▓	▓▓	▓	▓	▓
45-MINUTE PERIOD	▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓▓	▓▓▓

2. DO YOUR CLASSES MEET 5 DAYS PER WEEK?

YES	NO
▓▓▓	▓▓▓▓▓▓▓▓▓▓

3. DO YOUR CLASSES MEET FOR UNITS OF 6 WKS.? 4 WKS.? 9 WKS.? 18WKS.?

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
6 WEEKS	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓
9 "	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓
9 "	▓▓	▓▓	▓▓	▓▓	▓▓▓	▓▓	▓	▓	▓	▓	▓	▓
18 "	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓ ▓	▓▓▓▓ ▓	▓▓▓▓ ▓	▓▓▓▓ ▓	▓▓▓▓ ▓	▓▓▓▓ ▓

4. GIVE THE TOTAL NUMBER OF 60-MINUTE HOURS OF DRAWING TAUGHT

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
1-18	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓	▓	▓	▓	▓	▓	▓	▓
27-45	▓	▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓	▓▓	▓	▓	▓	▓
49-88	▓▓	▓▓	▓	▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓
88-90	▓	▓	▓	▓	▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓	▓▓	▓▓	▓▓
91-225	▓	▓	▓	▓	▓▓	▓▓	▓	▓	▓▓	▓▓	▓▓	▓▓

B. EQUIPMENT AND SUPPLIES

1. DO YOUR STUDENTS FURNISH EQUIPMENT? ARE THEY FURNISHED BY THE SCHOOL WITH STUDENTS PAYING FEE? FURNISHED FREE?

DO YOUR STUDENTS FURNISH SUPPLIES? ARE THEY SUPPLIED BY THE SCHOOL WITH STUDENT PAYING FEE? FURNISHED FREE?

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
PUPIL FURNISHES EQUIPMENT		▓	▓	▓	▓▓	▓▓	▓▓	▓▓	▓	▓▓	▓	▓
FEE	▓	▓	▓▓	▓▓	▓▓	▓▓	▓▓	▓▓	▓▓	▓	▓	▓
FREE	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓▓ ▓	▓▓▓▓▓ ▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓
PUPIL FURNISHES SUPPLIES	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓	▓▓▓▓▓	▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓▓
FEE	▓	▓	▓▓	▓▓	▓▓▓	▓▓▓	▓▓	▓▓	▓	▓	▓	▓
FREE	▓▓	▓▓▓	▓▓	▓▓▓	▓▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓

C. INSTRUCTION

1. DO YOU TEACH FROM A TEXTBOOK? INSTRUCTION SHEETS? MODELS?

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
TEXTBOOK	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓ ▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓▓ ▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓
INSTRUCTION SHEETS	▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓
MODELS	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓ ▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓

2. DO YOU OFFER THE FOLLOWING COURSES?

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
SKETCHING	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓ ▓▓▓	▓▓▓▓ ▓▓	▓▓▓▓	▓▓▓▓	▓▓	▓	▓	▓
GENERAL MECHANICAL DRAWING	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓▓ ▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓	▓▓▓▓	▓▓	▓▓	▓▓	▓▓
PATTERNMAKING DRAWING	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓▓▓ ▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓	▓▓	▓▓	▓▓
PATENT DRAWING					▓▓▓▓ ▓▓	▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓
ARCHITECTURAL DRAWING					▓▓▓	▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓
STRUCTURAL DRAWING					▓	▓	▓▓	▓▓	▓▓	▓▓	▓▓	▓▓
TOPOGRAPHIC DRAWING							▓	▓	▓	▓	▓	▓
AERONAUTIC DESIGN												
BOAT DESIGN												

D. UNITS OF STUDY

1. DO YOU TEACH LETTERING AS A SEPARATE UNIT?

YES	NO
▓▓▓▓▓▓▓	▓▓▓▓▓▓▓▓▓▓

2. ARE YOU PREPARING YOUR STUDENTS FOR INDUSTRY? COLLEGE? GENERAL EDUCATION?

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
INDUSTRY	▓	▓▓	▓	▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓
COLLEGE PREPARATORY	▓	▓	▓	▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓
GENERAL EDUCATION	▓	▓	▓	▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓	▓▓▓	▓	▓▓	▓▓▓▓	▓▓▓▓

3. IN WHAT GRADE DO YOU TEACH THE FOLLOWING?

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
LETTERING	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓	▓▓▓▓▓ ▓▓▓▓▓ ▓	▓▓▓▓▓ ▓▓▓▓ ▓	▓▓▓▓▓ ▓	▓▓▓▓▓	▓▓▓	▓▓	▓▓	▓▓
USE OF INSTRUMENTS	▓▓▓	▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓▓ ▓▓▓▓ ▓▓	▓▓▓▓▓ ▓▓▓▓ ▓▓	▓▓▓	▓▓▓	▓	▓	▓	▓
FREEHAND SKETCHING	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓▓ ▓▓	▓▓▓	▓▓▓	▓	▓	▓	▓
ORTHOGRAPHIC PROJECTION	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓▓ ▓▓▓	▓▓▓▓▓ ▓▓▓	▓▓▓	▓▓▓	▓	▓	▓	▓
ALPHABET OF LINES	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓ ▓▓▓	▓▓▓▓ ▓	▓▓	▓▓	▓	▓	▓	▓
ORDER OF PENCILING	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓ ▓▓▓	▓▓▓▓ ▓▓	▓▓▓	▓▓	▓	▓	▓	▓
BLUEPRINTING	▓	▓	▓	▓	▓▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓	▓▓	▓▓	▓▓
BLUEPRINT READING	▓▓	▓▓▓	▓▓	▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓	▓	▓	▓
ISOMETRIC	▓	▓▓	▓▓	▓▓▓	▓▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓	▓	▓	▓
CABINET	▓	▓	▓	▓▓	▓▓▓	▓▓▓	▓▓▓▓	▓▓▓	▓	▓	▓	▓
OBLIQUE	▓	▓	▓	▓	▓▓▓	▓▓▓	▓▓▓▓	▓▓	▓	▓	▓	▓
PERSPECTIVE	▓▓	▓▓	▓	▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓	▓	▓	▓	▓▓
DIMENSIONING	▓▓▓▓	▓▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓	▓▓▓▓▓ ▓▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓	▓▓▓▓	▓▓	▓▓	▓▓	▓▓
REVOLUTION	▓	▓	▓	▓	▓▓▓	▓▓▓▓	▓▓▓	▓▓	▓	▓	▓	▓
ISOMETRIC DIECTIONS	▓	▓	▓	▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓	▓	▓	▓
SECTIONS	▓	▓	▓	▓▓	▓▓▓▓ ▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓	▓▓	▓	▓
WOODWORK SHOP PROBLEMS	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓▓ ▓	▓▓▓▓ ▓	▓▓▓▓	▓▓▓▓	▓▓	▓▓	▓	▓
BILL OF MATERIALS	▓▓	▓▓	▓▓	▓▓	▓▓▓▓ ▓	▓▓▓▓ ▓	▓▓▓	▓▓▓▓	▓▓	▓▓▓	▓▓	▓▓
FURNITURE DESIGN	▓	▓	▓	▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓	▓▓	▓	▓
AUXILIARY VIEWS	▓	▓	▓▓	▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓	▓		
GEOMETRICAL CONSTRUCTIONS	▓	▓	▓▓	▓	▓▓▓▓ ▓	▓▓▓▓ ▓	▓▓▓	▓▓▓	▓	▓	▓	▓
DEVELOPMENTS	▓	▓	▓	▓	▓▓▓	▓▓▓	▓▓▓▓	▓▓▓▓	▓	▓	▓	▓
INTERSECTIONS	▓	▓	▓	▓	▓▓▓	▓▓▓	▓▓▓▓	▓▓▓▓	▓▓	▓	▓	▓
ORDER OF INKING	▓	▓	▓	▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓	▓▓	▓	▓
TRACING					▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓	▓▓▓	▓▓	▓
STRUCTURAL-STEEL SYMBOLS		▓		▓	▓▓	▓▓	▓▓	▓▓	▓▓	▓▓	▓	▓
ARCHITECTURAL SYMBOLS		▓	▓	▓	▓▓	▓▓	▓▓▓	▓▓▓▓	▓▓▓	▓▓▓	▓▓	▓▓
ARCHITECTURAL DETAILS		▓	▓	▓	▓	▓	▓	▓▓	▓▓	▓▓▓	▓▓	▓▓
PRELIMINARY STUDIES	▓	▓	▓	▓	▓▓	▓▓	▓	▓	▓▓	▓▓	▓	▓
HOUSE PLANNING		▓	▓	▓	▓	▓	▓▓	▓▓	▓▓	▓▓	▓▓	▓▓
PLUMBING DIAGRAMS		▓	▓	▓	▓	▓	▓	▓	▓▓	▓▓	▓▓	▓▓
ELECTRICAL SYMBOLS		▓	▓	▓	▓	▓	▓▓	▓▓	▓▓	▓	▓▓	▓▓
DAILY PROBLEM COMPETITION		▓	▓	▓	▓▓	▓▓	▓	▓	▓	▓	▓	▓
HOUSE MODELS						▓	▓	▓	▓	▓	▓▓	▓▓
MACHINE CONVENTIONS		▓	▓	▓	▓▓	▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓
MACHINE DETAILS				▓	▓▓	▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓	▓▓
GRAPHICAL DATA	▓	▓	▓	▓	▓▓	▓	▓	▓▓	▓▓	▓▓▓	▓	▓
ASSEMBLY		▓	▓	▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓	▓▓▓	▓▓	▓▓
WORKING DRAWING	▓▓▓	▓▓▓	▓▓▓	▓▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓	▓▓▓▓	▓▓	▓▓	▓▓	▓▓
GEARS					▓	▓	▓▓	▓▓	▓	▓▓	▓▓▓	▓▓
CAMS					▓	▓	▓▓	▓	▓▓	▓▓	▓▓	▓
PIPE DRAWING		▓	▓	▓	▓▓	▓	▓▓	▓▓	▓▓	▓		
SCALE DRAWINGS	▓▓	▓▓▓	▓▓▓	▓▓▓	▓▓▓▓▓ ▓▓▓	▓▓▓▓▓ ▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓▓▓	▓▓	▓▓

Tabulation of the returns

meetings per week are representative of the senior high schools.

The majority of schools hold to an 18-week unit course with a strong emphasis of 1 to 45 total hours in the junior high school, and 45 to 225 total hours per unit in the senior high school. This part of the survey shows that classifying a student according to the academic year or grade of school has no value as far as the drawing course is concerned. A tenth-grade, first-semester student in Waukesha may not compare in number of hours of drawing taken with that of a similarly classified student of drawing in West Allis, nor has he covered the same units or types of drawing. If there is this difference between the city systems, there surely is a greater divergence between the urban student and the student of the small rural section high school where time is that much more limited. See Table I.

According to the survey, the majority of the schools furnish the equipment, and the student furnishes the supplies. A certain percentage of schools furnish the supplies to the students free of charge.

Three methods of instruction are indicated as being used singly or in various combinations. The textbook has a strong lead over other individual methods of instruction, with combinations of textbook and model, and combinations of all three methods showing strong in all classes. See Table II.

The study discloses a strong tendency in the junior high school to continue general mechanical drawing through to the eleventh grade where the students are then offered the electives of architectural or machine drawing. Mechanical drawing was indicated especially through the ninth and tenth grades. See Table III.

The majority of schools indicated "General Education" as the objective sought.

The study shows that the units of work are widely distributed throughout the several grades, and the entire survey presents an excellent cross-sectional view of the teaching of drawing in the state.

TABLE I
Number of Weeks Devoted to Each Unit

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
4 weeks	2	2	4	4	1	1	0	0	0	0	0	0
6 weeks	1	4	1	2	6	5	7	6	3	3	2	2
9 weeks	4	3	7	7	12	11	2	2	1	1	1	1
10 weeks	2	1	2	1	1	1	0	0	0	0	0	0
13 weeks	2	2	1	1	1	0	1	1	1	1	1	1
18 weeks	19	22	17	20	36	36	36	32	33	30	26	26
20 weeks	1	1	1	1	3	1	0	0	0	0	0	0

TABLE II
Subjects Taught

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
Sketching	4	6	5	5	1	0	1	1	1	0	0	0
Mechanical Drawing	10	8	9	8	17	18	10	9	9	8	6	7
General Drawing	10	15	14	21	21	18	17	18	8	6	5	5
Architectural Drawing	1	0	1	0	0	0	2	4	8	6	5	5
Machine Drawing	0	0	0	0	0	1	3	2	5	7	5	5
Machine Drawing and Architectural Drawing	0	0	0	0	0	0	3	2	9	7	7	6
General Drawing, Mechanical Drawing, and Machine Drawing	6	5	4	2	21	13	10	5	6	4	7	7

TABLE III
Method of Instruction

	7B	7A	8B	8A	9B	9A	10B	10A	11B	11A	12B	12A
Textbook	6	5	3	4	13	12	9	9	10	8	6	6
Instruction Sheets	2	1	1	1	2	2	2	3	3	3	3	3
Models	3	3	4	4	3	3	1	1	0	1	1	1
Textbook Models	10	10	8	12	20	12	5	4	6	3	2	2
Textbook Models Instruction Sheets	5	9	9	11	16	14	20	14	13	16	14	14
Instruction Sheets Models	4	5	6	2	6	7	4	5	2	1	1	1
Textbook Instruction Sheets	1	1	2	2	0	0	5	5	4	3	3	3

Selection of a Vocation

R .T. Craigo
William Hood

Assistant Director Industrial Education, Dunwoody Industrial Institute, Minneapolis, Minnesota

Helping the boy make the momentous decision "What trade, occupation or profession shall I follow?" is of special interest to every teacher of industrial arts and vocational education.

A wise old Roman made the statement many hundred years ago that "there are 'round' and 'square' people and 'round' and 'square' jobs, and that the problem is to get the 'round' people in the 'round' jobs and the 'square' people in the 'square' jobs." Many educators and employers have, therefore, concluded that there is only one job or line of employment for each individual. One employer stated: "You can force a square shaft into a round hole with a sledge; but it is hard on the shaft." Every experience goes to prove that

there are probably a hundred different jobs or positions or lines of work into which an individual *may* go. Probably from 50 to 95 of these jobs would furnish satisfactory employment, and there may be from five to ten out of these hundred jobs that should be avoided due to some limitations which may be physical, personal, or undesirable for this individual due to one of a score of different reasons.

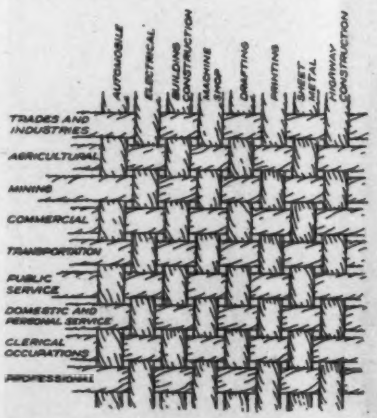
It, therefore, seems rather obvious that no individual or agency can solve the problem: "What one line is best for John Smith to follow?"

The Nine Basic Occupations

There are nine basic occupations, and it is desirable for any young man, or older man as far as that goes, to give consideration to them. They are as follows:

1. Trades and Industries
2. Agriculture
3. Mining
4. Commerce
5. Transportation
6. Public Service
7. Domestic and Personal Service
8. Clerical Occupations
9. Professions

It is highly desirable that careful thought should be given to the fact that if we consider these basic occupations and represent them by nine horizontal lines, we may then draw eight or more vertical lines crossing these — each of these vertical lines representing a trade or industry, like electrical work, machine-shop work, carpentry, etc. This will give us a lot of cross lines a good deal like the "warp and woof" of a piece of woven cloth. This brings out



the very important fact that weaving through all nine occupations we will find practically all of these various trades in use. For example, the electrical worker will be found in trades and industries; likewise, he will be found in the manufacturing lines; he will also be present even out in the agricultural activities where we have an increasing demand for farm-lighting plants, electrical farm and dairy appliances, radios, and the like.

In the same way, we will find the person who has a background of training and experience in business being called upon in all of the nine occupations, since we cannot conceive of any occupation making any headway without requiring a knowledge of business.

Therefore, Dunwoody, when it trains its students in industrial and mechanical lines, is giving them the foundation so that they may go out and secure employment not only in trades and industries — one of the nine basic occupations — but also in various others of the remaining eight basic occupations.

For students who plan to enter Dunwoody Institute there have been prepared Advisement Leaflets No. 1 and No. 2 which will give students valuable suggestions not only for entering Dunwoody, or some other school, but also for planning their future life.

Hobbies

It is well at this time to call attention to the fact that many young men in making their plans ahead, confuse avocational interests (hobbies) with vocational interests (employment to earn a living).

There are a few outstanding examples of young men who have been very successful in making their life's work out of their hobby or avocation. Babe Ruth, as a hobby, played baseball on the back lot and turned it into a wonderfully successful career; Lindbergh turned his avocation of aviation into a successful career; Edison turned his avocation of dabbling in electricity into a world's outstanding success. We, therefore, advise and even urge young men to think very carefully before they pick a vocation based on their avocational interests. For example, if a boy has a hobby or avocation of experimenting with radio hook-ups and construction, it may be better for him to earn his living as a machinist and enjoy his radio experimentation in his spare hours. Another very appropriate illustration is music. Many people get a great deal of joy and pleasure out of music, but it does not at all follow that these same individuals should turn to music for their vocation.

Crowded Fields

Young men should also give careful consideration to the fact that there are certain fields very much overcrowded not only because of the avocational urge, but also because they are receiving undue publicity which has given them a "halo of romance." For example, a few years ago the newspapers were filled with reference to the wonders of aviation; in fact, airplane manufacturers and those connected with the industry set out with the avowed purpose of "making the country air-minded." As a result, hundreds of thousands of youngsters decided that they wanted to be aviation mechanics. Many public schools were compelled by popular demand to install aviation courses, and a large number of "mushroom" aviation schools conducted for profit sprang up throughout the country.

We are now in the midst of another flood of publicity on Diesel engines brought about, no doubt, by the success achieved with the air-streamed Diesel engine locomotive. As a result, thousands of young men are trying to find where they can become "Diesel engineers."

Romance of Employment

The electrical field has always made a romantic and popular appeal and, as a result, thousands of boys who like to "tinker with the radio" or "ding the doorbell" want to become "electrical engineers." As a result, the electrical departments in practically all trade and industrial schools have a tendency to be overcrowded so that, in addition to the limited number of young men who should go into this field, there are likely to be a far larger number of young men who cannot and will not make any progress in electrical training.

There are other fields and trade and industrial lines, like building construction and machine-shop practice, to which there is less publicity given and which are not surrounded by any "romantic halo," and which probably have more chances for favorable employment.

Another field, namely, the automobile field, also is occasionally overcrowded by many young men whose idea of an expert automobile mechanic is solely pictured by "sitting in an upholstered seat with their hands on a steering wheel and going down the highway at eighty miles an hour." This field, too, is an excellent one for properly qualified young men who have ability and industry, but it can only absorb a certain percentage of workers, all of which must be considered by the one who is trying to decide "what trade or industry should I follow."

Opportunity—a Testing Device

Harvey E. Parry

Manual Training High School,
Brooklyn, New York

A testing device which is both interesting and helpful in the classroom.

The wide-awake teacher, open to new examination ideas, will probably welcome the novel, classroom-tested scheme described herewith. Educational philosophies have developed elaborate methods for testing pupil instruction retention, some along the lines of the formal examination, some by means of true-and-false tests, others by means of completion tests, and the like. To a more or less degree, these, along with other types of examinations not enumerated, carry with them the idea of a barrier or hazard to the functioning of the student mind. An endeavor to convert this "hazard" into an "opportunity" for pleasurable, pictorial, action demonstration of student knowledge has resulted in the development of the accompanying test.

It will be noted from the illustration that the test consists of a board into which suitable grooves have been cut so that pieces, or "men," may be moved about a continuous outer margin or circuit. This margin is connected with similar grooves making internal patterns consistent with the questions asked.

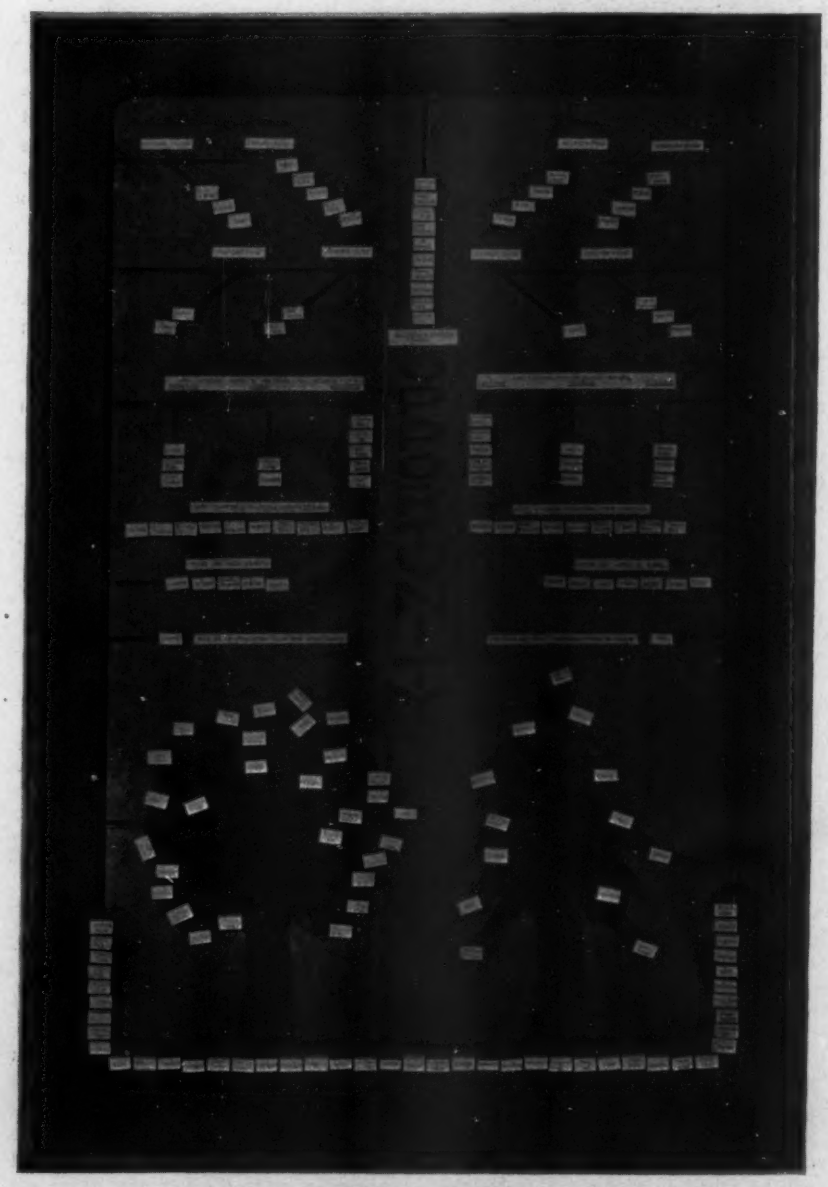
The board illustrated, was used with marked success and pupil satisfaction, to test the skills and knowledge of a woodworking class. In the outer margin can be found 175 "men" representing tools, materials, procedures, etc. Those relating to the various kinds of tools are to be moved into the correct marked stations in the upper portion of the board. Beneath this, to the left, is a groove, the proper filling of which requires a selection of material, tool, and procedure "men" for the squaring of stock. Its counterpart on the right side requires a listing of holding devices, permanent, temporary, and equipment. The next complete groove below relates to the finishing of wood: on the left side, materials and procedures for painting wood; on the right, materials and procedures for shellacking and varnishing. Next, on the left, is a groove for the classifying of wood screws; its counterpart on the right treats similarly of nails.

At the bottom of the board are illustrated a broad-leaved tree and a conifer. The student is required to select from the available "men," woods from the hard- and softwood families and place them upon the correct tree.

A random sampling of the "men" used in the test includes the following:

knife	lag screw	redwood
gauge	galvanized screw	oak
rule	brad	ash
square	nails	poplar
plane	pine	chestnut
saw	spruce	mahogany
vise	hemlock	whitewood, etc.
cabinet glue	fir	
casein glue		

Each "man" consists of a piece of 5/16 by ⅜ by ¾-in. wood into the back of which a rivet has been glued. The rivet shank should be long enough to come through the block flush with the surface and still leave sufficient length between the block and the under-



The testing panel

side of the head to fit freely over the edges of the groove, which is made just a little wider than the diameter of the shank of the rivet. To the surface of the block is pasted a piece of paper on which is typed or printed a word, an idea, or a short statement. For example: White lead, ripping, layout, mallet, and the like. The blocks are stained with different water colors to add color interest; the trees are painted in natural colors; and the background of the board under the grooves is a brilliant scarlet, painted, of course, before assembling.

The grooved board is mounted upon a firm back with suitable spacers between the back and the grooved section to permit free movement of the rivet heads of the "men." These two surfaces are glued together and framed. The board as described is 24 in. wide and 36 in. long. The grooved section is made of ⅛-in. pressed board. Hard-surfaced cardboard or wall board also may be used. The back is a piece of three-ply veneer.

Although this test was designed primarily for use in a woodworking class, there is no reason why it cannot be adapted readily to many different fields and interests with appropriate changes in subject matter. Its size, also, can be varied to meet conditions. It also may be made double-sided by adding a grooved layout on the other side. In this way economy of construction and storage may be achieved, as two tests will then take up but little more room than one.

Typesetting Contest

R. Randolph Karch

Arsenal Junior High School, Pittsburgh, Pennsylvania

This type of contest can be made a valuable aid in any shop class.

A typesetting contest will not only stimulate interest and a competitive spirit in the printing class, but will point out, through a study of errors made, just what types of errors the boys should guard against in the future, both in regular work and in contests.

Every 9B and 9A printing pupil in the Arsenal Junior High School took part in a typesetting contest held last November. Each pupil set the same copy, at the same time, in 10-point Caslon 540 twenty picas wide. At a given signal, each participant worked for thirty minutes. Proofs were then taken, and the instructor examined each composing stick as well as the proofs for errors. The sticks were examined in order to find such errors as loose lines, etc.

All pupils took part in the contest, but 9A pupils were omitted from the results of this report. Thus each contestant had identical preparation, and each was a 9B pupil. The best compositor in the 9A group proved to be a girl, who set thirteen lines with one error, scoring 12.5 for the half hour.

The results are shown in the accompanying table. The winner of the contest set 11 lines with one error, which netted him a score of 10.5 lines for the half-hour period. The pupil at the bottom of the list set 6 lines and made 10 errors, netting him a score of 1.0. Note that the I.Q. (Otis) had little correlation with the results of the contest. A boy with an I.Q. of 92 ranked twenty-second, one with an I.Q. of 72 ranked eighth, and one with an I.Q. of 102 ranked seventeenth. It is unfortunate for this study that no mechanical-aptitude-test results are available.

As a correlated lesson in arithmetic, each contestant figured his total number of ems set per hour, in the following manner: 12 (points) × 20 (picas) = 240 points per line of type. 240 ÷ 10 = 24, the number of ten-point ems in the line. If the boy set ten lines in one-half hour, 24 × 10 × 2 = 480 ten-point ems per hour.

Results of Typesetting Contest

Pupil	*Lines Set*	*Errors*	*Score*	*I.Q.*
A	11	1	10.5	110
B	10	2	9.0	108
C	9	1	8.5	89
D	11	5	8.5	108
E	9	1	8.5	97
F	8	0	8.0	96
G	9	2	8.0	111
H	9	2	8.0	72
I	9	2	8.0	98
J	8	1	7.5	98
K	8	3	6.5	109
L	9	5	6.5	100
M	9	6	6.0	100
N	7	2	6.0	99
O	9	6	6.0	104
P	7	3	5.5	87
Q	10	10	5.0	102
R	7	5	4.5	84
S	9	9	4.5	78
T	6	3	4.5	79
U	6	5	3.5	98
V	6	10	1.0	92
Averages ...	8.4	3.8	6.5	96

A study of the table of errors points out the causes of mistakes made by the contestants. Note that 46 of the 112 errors made were tabulated under "Caused by dirty case." These errors consisted of the following typical errors: n for u and vice versa; b, d, p, and q mix-ups; f for g and vice versa; i for s and vice versa; and other errors which proved that the dirty case caused almost one third of the total number of errors. *These figures are more significant to the pupil to prove that correct distribution is very important than lecture after lecture on the subject* by the instructor.

Misspelled words caused 24 of the 112 errors. This data came as a surprise, as few mistakes of this kind appear in the regular work. No doubt, under stress of the contest, copy was read far ahead, causing unfamiliar words to be spelled wrong.

Study of Errors

1. Caused by dirty type cases.....	46
2. Misspelled words	24
3. Loose lines	17
4. Uneven spacing	6
5. Letters upside down.....	5
6. Space left out between words...	4
7. Words left out of copy.....	6
8. No indention for paragraph.....	2
9. Space placed in wrong place....	1
10. Punctuation mark left out.....	1
Total errors	112

Loose lines totaled 17 of the 112 errors. Uneven spacing was noted in only six lines. Any line that was not spaced according to shop rule was marked "uneven." Decreasing combinations were 3-em and 4-em, 4-em and 5-em. Increasing combinations were 3-em and en, en and 3-em plus 4-em, 3-em plus 4-em and two 3-ems, two 3-ems and 3-em and en.

Letters nick down totaled 5; space

(Continued on page 340)

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Kelvin, the Scientist

Contrary to the idea held by many that shop subjects and cultural subjects are separated by a wide gulf, quite the opposite is true. There is much to be learned about the history of tools, the production and preparation of materials, the methods of transportation, and the uses made of tools and materials by different peoples. Then, too, there are stories about inventions and inventors, about the interesting and oftentimes romantic tales connected with important discoveries of materials, processes, or uses; all of which furnish cultural content which should not be overlooked. Probably one of the most prolific sources of these cultural contacts between industrial arts and vocational education and the customary academic subjects, is the biographical material about men who have made possible our present method of living. Material of this kind is valuable not only for tying academic and shop subjects together, but also for adding interest and zest to the practical subjects, and for giving the student a comprehensive idea of the basis of present-day civilization and of the interdependence of the peoples of the earth. Anniversaries of the births of some of these great men, or other celebrations in their honor, offer valuable opportunities for introducing this type of biographical material into the regular shop routine.

The following material on the life of Lord Kelvin may be found helpful if used in this way. The subject is timely, since a bust of this eminent scientist was presented to the Smithsonian Institute by the English-Speaking Union of the British Empire on October 8, 1936, as a special mark of honor to this great scientist and as a token of good will between England and America.

June 26 of this year, marked the 112th anniversary of the birth of William Thomson, Baron Kelvin of Largs, who may be ranked as one of the greatest of British scientists. He was born at Belfast, Ireland, June 26, 1824. His father, James Thomson, LL.D., was at that time professor of mathematics at the University of Glasgow. The guidance and education given to the young son by his father enabled William to enter the University of Glasgow at the age of ten.

In 1841, he entered Cambridge University, and after his graduation in 1845, he went to Paris where he spent a year in the laboratory of Regnault who was at that time studying the thermal properties of steam. At the age of 22, he was given the chair of natural philosophy at the University of Glasgow and he continued in this position for fifty-three years, influencing by his own enthusiasm and genius the students who flocked to his lectures.

He was not satisfied by merely influencing those with whom he came in personal contact. He was a very prolific writer, and more than three hundred original papers on scientific subjects bear the marks of his authorship. He also was the first editor of the Cambridge and Dublin Mathematical Journal, and many of his discoveries were announced and discussed in this publication.

His work on thermodynamics may properly be classed as his most important scientific contribution, but his work in the field of electricity is no less notable. Both Alexander Graham Bell, the inventor of the telephone, and Michael Faraday were friends of Kelvin. He early realized the importance of electricity and was one of the first, if not the very first, to light his home by electricity. He was very ingenious in devising apparatus for demonstrating and measuring scientific findings, and the mirror galvanometer, and many inventions and improvements in electricity and telegraphy are the results of his genius. He also improved the mariner's compass and the sounding apparatus for taking deep ocean measurements, and he simplified the method used in his times for determining the position of a ship at sea.

When the Atlantic Telegraph Company was formed to lay the first transatlantic telegraph, he was made one of the directors, but it was he who showed the engineers how to overcome the difficulties which all but wrecked the venture.

In 1866, he was knighted, largely as an acknowledgment of the work he had done for transatlantic telegraphy, and in 1892 he was raised to the peerage with the title Baron Kelvin of Largs.

In 1896, the golden jubilee of his professorship brought him more honors. Domestic and foreign scientific bodies vied with one another in showering honors upon him, and the grand cross of the Royal Victorian Order also was conferred upon him on this occasion.

In spite of the high positions which he held as educator, engineer, inventor, consultant, executive, and scientist, he was extremely modest and unassuming, ready at all times to give credit to the efforts of the humblest of his co-workers. He was equally approachable to his students, ever eager to help them onward on the road of learning. At the very pinnacle of his profession, he still liked to look upon himself as merely a student, and when in 1899, three years after celebrating the fiftieth anniversary of his professorship, he resigned his chair at the University of Glasgow, he again formally matriculated as a student so as to maintain contact with his beloved school. In spite of his 75 years, he remained active as a writer and lecturer. He also continued to take great interest in the proceedings of the various scientific organizations to which he belonged, and only a few months before his death he delivered a long lecture on the electronic theory of matter. His death took place on December 17, 1907.

A perusal of an account of Lord Kelvin's life is an inspiration to students and teachers alike. Students can learn from him what it means to work hard in acquiring knowledge and success, and teachers can profitably use his life as a model for their own guidance in the classroom.

Advancing the Interests of the Teacher and of the School Shop

A professional periodical that wants to give the best possible service to its readers, must ever be on the alert to check its contributions with the needs and desires of those who constitute its circle of readers. One method of finding out reader reactions is by asking for comments on the material that is being offered. Some of the criticisms and suggestions received are exceedingly helpful, others are puzzling, to say the least.

One of those received lately suggests, "Tell *us* how to get ahead and how to advance our departments — stop the old editorial ballyhoo about our duty to society and children in spite of no pay."

In glancing over the 1936 proceedings of the Western Arts Association, the following remark may be found among the very opening paragraphs of Mrs. Wanda L. Wheeler's address: "For truly, there is neither East nor West, North nor South, when teachers of the youth of our country stand face to face with the same problems, the same ambitions and longings in their hearts for the boys and girls, the young men and young women who come to them for instruction."

Evidently, Mrs. Wheeler, as president of the Southeastern Arts Association, representing several hundreds of art teachers, does not think it ballyhoo to emphasize the teacher's interest in the child as a child. She realizes, as all good teachers do, that the duty to the boy and girl is the prime motivating urge which must underlie all of the teacher's efforts, if he is to do justice to himself and to the profession to which be belongs. That these are not mere words is evidenced by the heroic efforts and sacrifices made by many teachers, especially shop teachers, during the past five years. Whether they should have been forced to make these sacrifices is a question that does not come under consideration at this time. The fact remains, they voluntarily chose to carry on, and to do the best they could for the members of their enlarged classes, even though salaries had been slashed and checks were frequently slow in coming. Their love for their work and their professional attitude helped them over the rough spots. Many a lone shop-teacher, who felt sore at heart at the treatment accorded him, fortified himself by studying the methods adopted by some of the earlier pioneers in his field of education in adjusting themselves to the trials and tribulations which confronted them, and he emulated his predecessors by philosophically resigning himself to continue in his profession even though it meant sacrifices and labor for which little or no remuneration might be expected. The material written to encourage these altruistically inclined and professionally minded teachers may appear as ballyhoo to some; to others it was that which helped them to continue in a difficult situation.

As for "telling *us* how to get ahead and how to advance our department" it might probably help the man who wrote this comment if he would go over the back copies of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION which make up the present volume. He might get help and inspiration from reading what others have done. For his convenience, some of the more helpful articles are referred to in the footnote.* By translating some of the material contained in these back numbers into action, he would insure in his own classes a better adaptation of industrial matter to the student, the obtaining of better student reactions, better methods of grading, the construction of better outlines of instruction and lesson material, a better understanding of what is expected of him as a teacher of industrial arts or vocational education, a better idea of what others are doing, a greater realization of what is confronting the teacher of the present, and a better understanding of his responsibilities. He also would get a better grasp of the philosophies which underlie industrial arts and vocational education — all of which would function in getting the individual teacher's work to progress and his department to advance. Much more, of course, might be said. Lack of space forbids this. After all is said, getting ahead personally and insuring departmental progress depends upon individual effort, and upon how we make use of our time in studying what others are doing, avoiding their mistakes, adopting their success, keeping an open mind, and making use of the faculties with which we have been endowed.

The Annual Conventions

The annual convention season is about to open. These yearly meetings serve a very important purpose. They offer opportunities for a profound, concentrated, and united attack on the problems which confront the educators of the country. They present occasions for making comparisons between educational movements, inaugurated in various parts of the country. They give the new teacher a chance of meeting and learning from his more experienced brethren. They offer opportunities for becoming acquainted with one another, for forming friendships, for renewing old ties that may have become loosened.

With this in mind, every shop teacher who can possibly arrange to do so should attend the conventions of both city and state associations. If possible, he also should plan to attend the conventions of the American Vocational Association, the Western Arts, the Eastern Arts, and similar other national bodies. The next national convention, which may and ought to be attended, is that of the American Vocational Association, which will be held at San Antonio, Texas, December 2, 3, 4, and 5, 1936.

*The articles which follow have all appeared in the 1936 volume of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION: "Accommodating the Larger Classes," Harry J. McStay, February, 45; "Class Personnel Organization," Stanley S. Radford, July, 275; "Controlling Theft in the School Shop," E. L. Southard, V. J. Lockett, M. M. Black, February, 55; "Criteria of Curriculum Construction," Burl N. Osburn, August, 229; "Education for the Subnormal Boy," Paul L. Caulwell, February, 54; "General Shop and the Student," Harold J. Davison, July, 199; "Guidance and Industrial Arts." Russell H. Landis, January, 7; "Guiding Principles in Planning a Course in Woodwork," Sam. M. Ford, July, 216; "Home-Workshop Organization," Ross C. Cramlet, August, 250; "How Do You Grade or Mark?," Stanley J. Pawelek, May, 145; "How Do You Interpret Industrial Arts?," William E. Warner, February, 33; "Industrial Arts in the Smaller School," Wm. J. Micheels, June, 182; "Industrial-Arts Teacher of the Future," James E. Hopkins, September, 277; "The Industrial Laboratory," A. C. Tagg and Leslie E. Wagner, February, 35; "The Industrial Trip," Stanley S. Radford, July, 208; "Interest and Learning," Gilbert L. Betts and Roy R. Van Duzee, May, 135; "Points for Personal Analysis," Louis M. Roehl, August. 248; "Practical Arts as Moral Education," Arthur B. Mays, June, 165; "A Responsibility of the Industrial-Arts Teacher," Thomas Diamond, March, 78; "Securing Public Approval for the School Printshop," Bert Popowski, May, 150; "Shopwork for the Special Class," Kenneth R. LaVoy, February. 53; "Straight Thinking About Integration," Jesse E. Rathbun, August, 234; "Strengthening Industrial-Arts Testing and Guidance," George C. Decker, June, 172; "Teaching Aids," Carl v. Lindeman, June, 191; "Useful Publicity Program," D. W. Castle, August, 240; "What to Do with the Dull Child?," Paul C. Hoopes, January, 8.

(Continued from page 337)

omitted between words totaled 4, words left out of copy totaled 6, lack of indention 2, space placed in wrong place 1, and punctuation marks left out 1.

After the contest a frank discussion was held with the participants as a group on the causes of errors. It was easily brought out, with the use of the table of errors, just what caused each mistake. The discussion brought about a resolution that inasmuch as poor distribution, misspelled words, and loose lines caused the great majority of errors, these three things would be watched more carefully in future work.

And the classes do — which justifies the contest as a teaching device!

Teaching Machine-Shop Practice

H. F. Kieckheafer

Hammond Vocational High School, Hammond, Indiana

A method of acquainting and habituating the student with the need and mode of planning his work.

Machine-shop equipment consists in part of certain standard machines, usually consisting of the lathe, the drill press, the shaper, the planer, the milling machine, the grinding machine, and the boring mill. A machinist who is capable of placing a piece of stock in any of these machines, and by skillful manipulation of various knobs and levers perform the operations which will change the form and shape of the piece accurately according to blueprint specifications so that a completed piece of work will be produced in the shortest possible time, is one who must have considerable knowledge of the sequence of operations; the knowledge of how to do the job to assure accuracy of result in the shortest time, and has developed the habit of planning his work.

The Hammond Technical Vocational High School recognizes the value of job planning and emphasizes it in its shop courses. Each student is required to make out a job-plan ticket before he is allowed to begin work on any job. This is continued through his entire stay in the shop class. The ability of the boy to make out a job-plan ticket for his first job has many times been questioned with remarks as, "How can the boy make out a job-plan ticket of required operations for his first job, when, as a beginner he knows nothing about the operations of machine-shop work?" "The beginner does not know the meaning of the terminology of an operation. If the terms necking, facing, or taper turning have no meaning to him, how can he be expected to make out a job-plan ticket giving the correct sequence of operations necessary to complete his first job?"

The machine-shop instructor, recognizing how difficult it is for the beginner to plan his first job, has so arranged his instructional material to make it easy and comprehensible. A short description of this arrangement of instructional material will follow.

First, the instructor has assembled a collection of more than one hundred jobs. Each job is a complete piece of machine or benchwork that has utilitarian value. These jobs have been arranged on a display board on the wall of the shop in a sequence based on simplicity of operations involved in doing the job. A detailed explanation of the first two jobs will be given to show what is meant by simplicity of operations, using lathe work as an example.

FIG. 1

Job 1 is the piston-pin and bushing driver shown in Figure 1. This tool is used in the school shops to drive out piston pins or bushings. To make this tool, three simple lathe operations are required. They are: straight turning, shouldering, and squaring the ends. Straight turning, in the terminology of the machinist, means to change the diameter of a piece of stock. When a piece of work requires the turning of two or more different-sized diameters, there is formed at the meeting of these two sizes, a fillet. This fillet is removed by an operation known as shouldering. Squaring the ends is what the term implies, that is, to make the ends square. These are simple lathe operations.

The second lathework job is the blank for the vise screw shown in Figure 2. To make this screw blank, four lathe

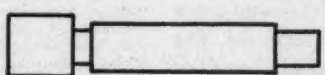


FIG. 2

operations are required. They are: straight turning, shouldering, squaring the ends, and necking. This job necessitates the repetition of operations required in making the first job, but with the addition of one new operation, that of necking. This plan of adding only one new operation facilitates the learning of the new operation and is followed through the entire course. This prevents the beginner from becoming confused or discouraged.

The boy follows the sequence of operations as set up on the board but does not necessarily do the same jobs. If he shows marked ability, he may be given more complicated work which comes in to the shop involving two or three operations that are new to him.

The second arrangement of instructional material is the placement of blueprints at advantageous points in the shop. These blueprints show setups for various machines, fundamental lathe operations, methods of holding and clamping work in the machines, also blueprints showing how and when to use the protractor, the level, the surface gauge, etc. To these various blueprints the boy is referred when the occasion arises.

The Hammond Technical Vocational High School uses the method of individual instruction. In the machine shop, there are available job sheets, operation sheets, information sheets, and reference sheets covering all fundamental requirements of the machinists' trade. When the boy comes to the shop, he is given a lesson sheet, "Information for Beginner." This sheet requests him to read the safety rules, and states that the aim of the instructor is to prepare him for a profitable job, and that each piece of work which he is required to do in the school shop is a step in that direction. On the sheet also are routine instructions of the shop.

The third phase of the use of instructional material is an explanation of how

the jobs on the display board, the job reference sheet of fundamental lathe operations, and the operation sheet function in simplifying for the beginner the problem of making out a job-plan ticket. The boy is given a blueprint on which is a drawing of the piston-pin and bushing driver (See Figure 3) with the required dimensions. It

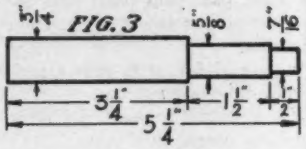


FIG. 3

tells him what material to use, what he will make, and what it will be used for. At the same time, he is given an information sheet which requests him to go to the display board and look at the piece marked Job. No. 1, and compare that piece with his blueprint of the piston-pin and bushing driver. (Many beginners in machine-shop work are unable to understand blueprints so this comparison is made to help clarify the work and to show the relation between the blueprint and the completed piece.) Having compared the piece with the blueprint, the sheet requests him to report to the instructor who will give him a job reference sheet of simple fundamental lathe operations. A short explanation of the reference sheet is given.

The job reference sheet of fundamental lathe operations is a blueprint 20 by 21 in. which is divided into twenty-eight 3 by 5-in. sections. Each section consists of a drawing of a simple fundamental lathe operation with a short explanatory note giving the terminology for that particular operation. Two sections of the job-plan reference sheet are shown as an illustration. Section 1 shows a piece of stock with a lathe dog attached and supported on the lathe centers. Also, short notes with arrows pointing out the various parts of the lathe in relation to the work. See Figure 4.

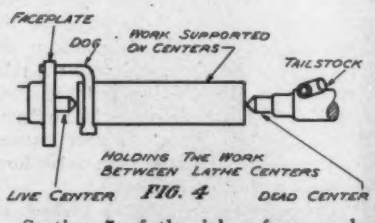
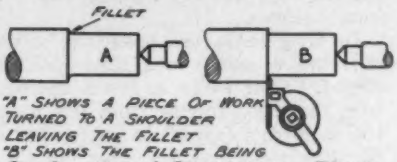


FIG. 4

Section 7 of the job reference sheet shows a piece of work having two diameters turned to a shoulder leaving a fillet as shown at A in Figure 5. At B in Figure 5 is shown how the fillet is cut out with a shouldering tool.



"A" SHOWS A PIECE OF WORK TURNED TO A SHOULDER LEAVING THE FILLET "B" SHOWS THE FILLET BEING CUT OUT WITH A SHOULDERING TOOL. FIG. 5

Together with the job reference sheet, the boy is given a piece of stock which has been cut to the length required to make Job No. 1 and he is told by the instructor that out of that piece of stock, he is to make a piston-pin and bushing driver according to the dimensions given in Figure 3. He is also given an operation sheet "How to Make Out a Job-Plan Ticket." This sheet tells him where to get the job-plan tickets and instructs him how to find the operations on the job-plan reference sheet necessary to make the job. The operation sheet also explains how to fill out the job-plan ticket. It requires the student, when he has made out the ticket giving the sequence of operations as he thinks they should be done, to check them over carefully and if he thinks they are correct to take it to the instructor for checking. The instructor checks the operations and if they are not in logical sequence, the plan is returned to the boy and he is requested to try again. If the boy is unable to arrange the operations in logical order after he has made an honest effort, the instructor points out to him on the reference sheet the operations required to complete his job successfully.

The purpose of the job-plan ticket is fourfold. First, it trains the boy to develop the habit of planning his work step by step so that it will become a fixed habit to visualize the finished product before he begins the actual work. This planning eliminates the "trial and error" method of learning, and minimizes the amount of lost motion, time, and material. Second, it trains the boy to think so he will form the habit of thinking out his own problems. Third, it lets the instructor know that the boy knows what operations he must do to complete his job successfully. Fourth, one of the requirements of the job-plan ticket is that the boy check off each operation as he completes it. This enables the instructor to keep an accurate check of his work.

The use of the instructional material and the job-plan ticket having been explained, there remain four other phases of vital importance in teaching the machine-shop trade to beginners. They are to hold the interest of the boy in his work, to create interest in his work when no interest is shown, to teach the boy to operate his first power-driven machine, and to have a definite system of checking for the instructor so as to keep an accurate check on progress made. It has been found that most boys wish to take machine-shop work because they are fascinated with the desire to operate a machine and to be able by manipulation of various knobs and levers to turn out a complete job. This fascination is fostered by placing the boy at the lathe as soon as possible, usually the second day after entering class. The instructor has arranged the shop course so that the boy is required to alternate with machine and bench-work. This is done so the boy will do (sometimes to him very tedious) bench operations enthusiastically as he looks forward to finishing his bench job so that he can again work on the lathe. To create interest when jobs are given to the boy, the instructor gives a detailed explanation of the value of the tool or piece of equipment which the student is about to make, so that the boy can see the importance of the piece of work, the responsibility intrusted to him, and the confidence the instructor has in his ability.

When the boy is assigned for the first time to a power-driven machine, every precaution is taken for the safety of the boy and to prevent him from breaking the machine. The boy is given an operation sheet which requests him to put the machine through a series of mechanical operations. He is placed in charge of a boy who has had at least two semesters of machine work. This boy performs the mechanical operations of the machine as required on the operation sheet while the learner watches him. When the beginner thinks he is able to do these operations, the boy in charge allows him to do so, and corrects him when he is wrong. When the boy in charge thinks the beginner understands the machine operations, he notifies the instructor. The instructor checks the boy according to requirements of the operation sheet, and if he is able to operate the machine to the satisfaction of the instructor, he is allowed to begin his job.

There is likely to be a tendency on the part of the shop instructor to assign special work that comes into the shop to a boy who has already mastered the operation involved in the work. This is easy for the instructor because it will

not require so much attention on his part. The danger of this practice is that the boy may repeat a few operations many times and will not have time during the semester to cover a wide range of machine operations as set up for a semester's requirements. To prevent this, an accurate system of checking operations mastered is necessary. Such a system of checking is used in the machine shop at the Hammond Technical Vocational High School. On the wall of the shop is a large chart

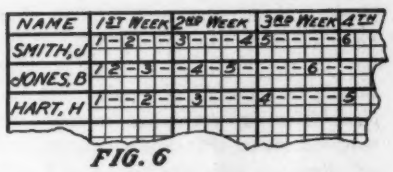


FIG. 6

as shown in Figure 6. On this chart is recorded the name of the boy the first day he enters class, a daily record of operations covered, and the time required for each job. These operations are recorded by number. The numbers correspond to the operations involved in the jobs on the display cards. These charts are kept from year to year and at the beginning of each semester a check is made of the operations which have previously been covered. This eliminates repetition of operations already learned and enables the boy to advance as rapidly as possible.

This method of teaching machine shop has been followed for a number of years and has proved effective. It holds the boy's interest, teaches him to think for himself, and prepares him so he can use the machine work either as a vocation or an avocation. Several industrial machine shops in this region in the past have been very anxious to get boys who have had their preparatory training at the Hammond Technical Vocational High School because experience has shown them that these boys are the type of workmen they are anxious to have.

Typical Information Sheet

INSTRUCTION FOR BEGINNERS

Sheet No. 0

Persons working in shops or factories are constantly exposed to danger of injury. Accidents happen quickly and as a surprise to the individual. "I didn't think" and "I was not looking" are common excuses. Almost all accidents may be avoided by paying strict attention to one's own business. "Stop, look, listen," is a slogan applicable in all shops where power and machinery are used. Here in this shop every precaution is taken for your safety, but your cooperation is necessary to protect yourself and the boys who are working with you from accidents.

To bring about this protection, safety rules are necessary, and they must be obeyed. Failure to do so means dismissal from the shop. Together with this sheet, you are given a copy of the safety rules of the shop. Read them and when you have done so, place them in your notebook, where they will be handy to read from time to time until you have memorized them. An examination on these rules will be given later.

The aim of your instructor is to prepare you to fill a profitable job, one that is interesting and has possibility for advancement. The work of a toolmaker is that kind of job. Manufacturers of automobiles change the models of the cars from time to time. Every time they do that, a great number of new dies, jigs, and small tools are required. This is also true in the making of manufacturing machinery. In slack periods when orders are few and men must be discharged the manufacturer takes advantage of the time and makes the changes. This keeps the toolmaker at work.

The toolmaker must be able to perform the various operations on the different machines. He must be able to use a file correctly, and to do his chipping with a chisel and hammer to the best advantage. It is also necessary that he be accurate in his measurements and have mathematical ability. You will be given jobs requiring machine and benchwork, and every job will be given for the purpose of teaching you some operation involved in toolmaking.

When you have read this sheet over carefully and have made a mental note of the safety rules, report to your instructor. He will give you a piece of stock together with instruction sheets Operation No. 2 and Operation No. 3. These sheets will tell you how to prepare that piece of stock so that you can later place it between centers of the lathe and make a piston-pin and bushing driver. Your next sheet Job No. 1 will tell you what procedure to take to make the piston-pin and bushing driver.

Machine-Shop Safety Rules

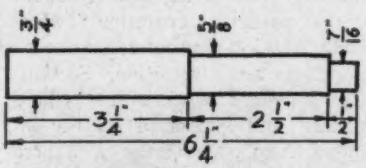
1. Roll up your sleeves.
2. Do not wear a ring.
3. Do not wear a long necktie.
4. Keep the wrenches and measuring tools on the lathe board.
5. Never put anything on the ways of the lathe.
6. Place your oil can where you will not jab your face against the spout.
7. Keep your hands away from revolving machinery.
8. Do not clean the hole in the lathe spindle with your finger when the machine is running. Always stop your machine when cleaning or oiling.
9. Do not move a handle to see what will happen.
10. Turn over your machine by hand before turning on the power.
11. Do not take hold of chips that run off the lathe or drill.
12. Wear goggles when grinding on an emery wheel.
13. *Look before you place your hands.*
14. Do not brush chips away from miller cutter when the machine is running.
15. Do not pass your hand over the work in the shaper when the machine is in motion.
16. In case of fire, stop your machine and walk out — *do not run.*
17. Use a clamp to hold the work when drilling on the drill press.
18. Never use a file without a handle.
19. If you get a steel sliver in your hand, have it taken out.
20. Wash your hands and put iodine on all places where the skin is broken.
21. Have a place for everything and everything in its place.
22. Never use a tool with a battered head.
23. Never use a hammer with a split handle.
24. See that all guards are in the proper place before starting the machine.

JOB: TO MAKE A PISTON-PIN AND BUSHING DRIVER

Job No. 1

This job is to make a piston-pin and bushing driver according to the specifications given in the drawing on this sheet. This tool is used in the school shop to drive out piston pins or bushings.

This is the first time that you will take a piece of stock, place it between the centers of a machine called a lathe, and by manipulation of the various knobs and levers on the machine, perform the operation which will change the piece of stock so that eventually a complete piece of work will be produced which will correspond to the dimensions given in the drawing.



The material used for this job is cold-rolled steel.

Take the drawing and go to the shop display board, look at the piece on the board marked Job No. 1, compare the drawing with the piece, and note the relation between the drawing and the completed job. When you can see the similarity between the two, report to your instructor. He will give you a job-plan ticket form and request you to fill it out.

A job-plan ticket form is a sheet on which you are requested to make out a list of operations required to make the job in the order that you plan to do them.

The instructor realizes that you do not

know the names of the operations involved in the making of this job so he will give you an instruction sheet "How to Make Out a Job-Plan Ticket." This sheet will give you information on how to find what operations are necessary to do the job. Read the sheet carefully and follow the instructions as given on the sheet. Each job requires that a job-plan ticket be made out and O.K.'d by the instructor before the actual work is begun.

MACHINE-SHOP JOB TICKET

Job No. .....

Name.....Date.....Machine.....
Time begun..... Total time required to complete the job.....
Time allowed for the job..... Point value of the job.....
What are you going to make?.....
What is it good for after you have made it? .....
.....
Of what training value is this job to you?
.....

Make out a list of the operations in the order as you plan on doing them. If it is a lathe job, be sure to state if you are going to place the work between the centers of the lathe, chuck it, or strap it to the face-plate and begin your plan with that operation. Have the sheet checked by your instructor.

If a sketch is necessary, make it on the other side of this sheet.

Check off each operation as you complete it.

OPERATIONS

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....
7. .....
8. .....
9. .....
10. .....Instructor's
11. .....O.K. here

OPERATION SHEET: HOW TO MAKE OUT A JOB-PLAN TICKET

To make out a job-plan ticket giving the operations required to form and shape a piece of stock to blueprint specifications, it is necessary to know the names of the operations and to know just what mechanical manipulations of the machine are necessary to bring about the desired result.

To find the required mechanical manipulations of the machine to perform an operation and to learn the name for the required operation in the terminology of the machinist, proceed as follows:

1. Take this sheet, the blueprint of the job you are to make, and a job-plan ticket form.

2. Go to the drawing desk or table which is provided in the shop for the purpose of making out your job-plan ticket.

3. On the wall of the shop just over the drawing desk, you will find a job-plan reference sheet which shows the drawing of lathe operations. (If you are going to use the table, take a reference sheet which is framed with you to the table.)

4. Look at the drawing of the piece you are to make, then look at section 1 on the job reference sheet and you will see the drawing of a piece of work supported on the lathe centers. Your job sheet mentions the fact that the piece is supported between the lathe centers. This is the first operation you will perform on the lathe, so place that statement on the first line of your job-plan ticket, thus "place work between lathe centers."

5. Having determined the first operation, look again at the job reference sheet, this time in Section 2. See if, in your judgment, that operation is the next operation required. If so, place it on the second line of the job-plan ticket. If the operation shown in Section 2 is not the one you think necessary to do the next step in doing the job, continue to look from section to section until you think you have found the right operation. Write the name of that operation on the second line of your job-plan ticket.

6. Continue arranging the operations in logical sequence on the job-plan ticket until you think you have specified all the operations required to complete the job.

7. Check the operation over again carefully and make any changes you think necessary. When you have completed your plan, take it to the instructor for checking.

Here is a sample of how the operations should be listed on the job-plan ticket.

1. *Place stock between the lathe centers.* .....
2. *Place the next required operation on this* .....
   line. .....
3. .....
4. .....
5. .....
6. .....

Note: Always make a neat sketch at the bottom of the job-plan ticket of the piece you are to make, unless the instructor tells you to work directly from the blueprint. Be sure to fill in all lines required to complete the drawing. Also, give all dimensions correctly.

General metal shop, Lowrey Junior High School, Fordson, Dearborn, Mich.

Pewter and Pewter Plates

Emerson W. Manzer
Bronxville, New York

Historical and practical at the same time, this article will be of interest to every lover of pewter.

A. Pewter plate of Hungarian origin, about 1607. Courtesy National Museum, Budapest

Pewter, that fascinating metal so prominent among amateur craftsmen, is one of the oldest utensil metals. Historically, it dates back 2000 years when the ancient Chinese fashioned exquisite articles of pewter. Later years found the Romans and ancient Britons making utensils of pewter for their homes and churches. Excavations of early Roman settlements in England have uncovered plates and dishes used by these people. The careful preservation of early specimens by museums, collectors, and historians has enabled one to study the use of pewter and the civilization of its contemporary users. During the troublesome Dark Ages the popularity of pewter is attributed to the survival of the craft of the pewterer, which later grew tremendously and flourished until the late eighteenth century. From this time on it began to decline due to the introduction of other wares, such as glass, silver, and earthenware.

Unfortunately, due to the ease with which damaged pewter could be recast, there is a scarcity of the very early pieces. The churches and monasteries cared well for their pewter, and, by doing so, have preserved for us a definite record of ecclesiastical pieces. Chalices, alms dishes, candlesticks, communion sets, flagons, and other utensils common to the period are listed among the ecclesiastical articles. The only Roman pieces of pewter are plates. This may be due to the fact that many plates were used and that they were used by many households. The use of pewter for the household undoubtedly started in the palaces of the kings, popes, bishops, and the nobility. Records show that Edward I (1288) had 100 dishes, 100 platters, and 120 salt cellars. Later the homes of the upper and middle classes used pewter for their service. It was not uncommon to have their tables and sideboards arrayed or garnished with the then precious utensil metal. A garnish usually consisted of 12 pewter plates, 12 pewter platters, and 12 pewter dishes. Many of the pewterers carried a stock to hire out for various occasions. If they did not have sufficient to fill the order they borrowed from another pewterer in the association.

In the homes of the artisan and the peasant, vessels made of wood, called *treen* were commonly used. (The word *trencher* so frequently used among our early colonists, comes from the word *treen.*) Later, when pewter became more common and within their means, they, too, used some pewter.

The manufacture of pewter was one of the most important industries during the Middle Ages, a period indefinitely applied to the time between the fall of the Roman Empire and the Renaissance (approximately between the sixth and fifteenth centuries). Up to the time of the establishment of the Pewterers' Guild, in the reign of Edward III, A.D. 1348, the craft of the pewterer was thought to have been only an association of a group of craftsmen. In 1348 the first ordinances were made regulating the craft of the pewterers, as they were then termed. From this time to 1863 there is a continuous record of this great craft which flourished during the reigns of many English kings and queens.

The major portion of pewter manufactured in Europe, during the centuries mentioned, was made from English tin. Some tin was mined in Spain, but the Moorish conquest cut off this supply to the continent of Europe. This gave England a monopoly on tin which she held for many years. Naturally the largest portion of the tin produced in England was used by the Pewterers' Company of London, and mem-

Student work in pewtercraft, Bronxville Junior-Senior High School, Bronxville, New York

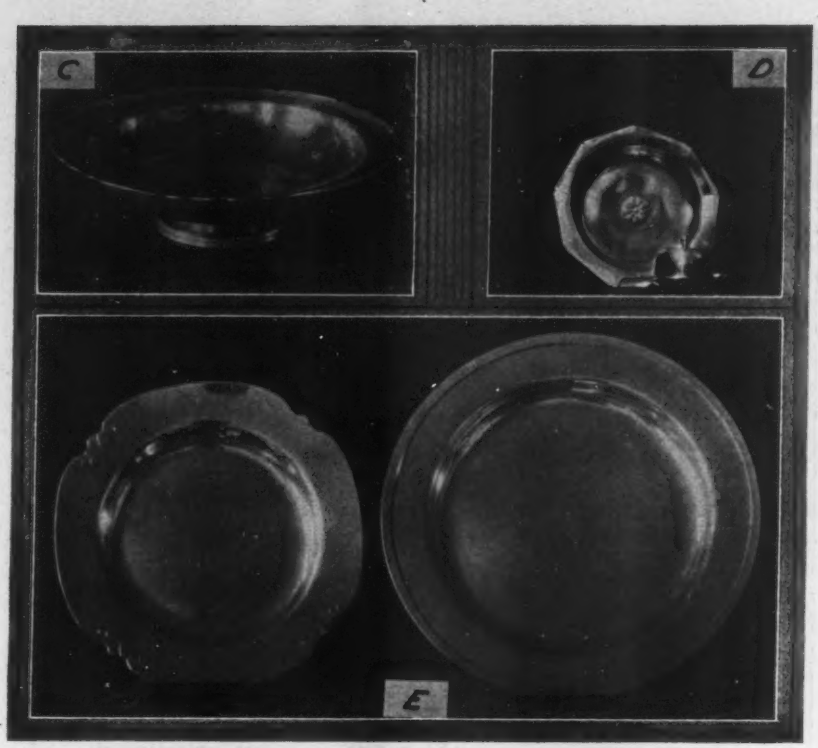


Fig. 1. C. Pewter bowl by junior-high-school student, Bronxville, New York. D. Chop plate and butter dish. Plate shows center rosette raised. Senior-high-school student, Bronxville, N. Y. E. Student work, summer session, Oswego Teachers College, Oswego, N. Y.

bers of the craft throughout the country.

The tin mines were called "stannaries," from *stannum*, the Latin word for tin. These stannaries were granted privileges and placed under strict regulations by the Crown. The tin of Cornwall and Devon was always the property of the Crown, no matter who owned the mines. In other parts of the United Kingdom, only the gold and silver were reserved to the Crown. Because the lands of Cornwall and Devon were controlled by the Crown, anyone, on complying with the necessary formalities could mine for tin if they paid the royal dues and 1/15 to the landowner. The pewter manufactured in America today is made from English tin from the Mediterranean area, there being little or no tin mined in America.

Pewter plates were cast in metal molds, cleaned and polished, and then hammered around the bouge, a characteristic of all English plates. Surface marks on plates, dating back to the 16th century, show that some form of lathe was employed in finishing the work. The excessive cost of all types of metal molds caused many of the pewterers to form an association so that they could make use of any molds purchased by the group. This is one reason why there are so many specimens of the same type, individuality being given the piece by modifying the design through its appendages. Cotterell, in his excellent book, *National Types of Old Pewter*, relates this interesting information pertaining to the "fashioning of pewter":

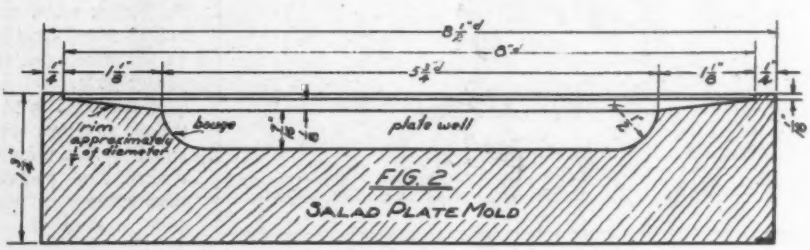
> From the beginning it was the custom among the pewterers for various kinds of work to be performed by different classes of craftsmen; thus we find in the early records, that *sad-ware-men* made sad-ware, by which is meant dishes, plates, chargers, and other more or less flat wares; *hollow-ware-men*, as the name implies, made the more bulbous flagons, pots, tankards, etc.; *spoonmakers* again, made spoons. Another branch was the lidding of stone-pots with pewter lids, and again there were men who specialized in the making of the pewter spiral "worms" for stills, whilst the *turn-wheel-men* turned the wheel which operated the lathe.

Itinerant pewterers, sometimes with an assortment of molds, went from house to house melting damaged utensils and recasting them into new ones. Spoons, plates, children's toys, and trinkets were listed among his wares. In our early colonial times, this traveling "tinker" also was found. Since pewter belonged to the farm home or log cabin, it was necessary to have some way in which to recast their damaged pewter, provided the home did not possess a mold of its own. It was not an uncommon sight to see this "tinker" standing near the kitchen fireplace, pouring a dozen new spoons or a plate or two. His work, along with many other forms of this early craft, has been obliterated by time and progress.

As clay was supplanted by wood, and wood supplanted by pewter, so was pewter supplanted by glass and a higher grade of earthenware. Today, after the passing of many centuries, all of these household materials may still be found in many European and American homes. Time marches on but it also leaves a record for those who follow. Pewter and "treen" form an integral part of our great colonial heritage. They not only form a part of our homes, but are now serving as a basis for many hobby activities in schools, homes, hospitals, and various craft clubs.

The fascinating old craft of the pewterer, with modern adaptations, is today recognized as a hobby by nearly half a million boys, girls, and adults. Many hospitals have recognized the therapeutic value of craft work and their patients are spending much of their leisure time fashioning heirlooms for tomorrow.

In order to assist in the perpetuation of the craft of the pewterer, and to aid the hobbyist, the following detailed information for making pewter plates is suggested. Pewter plates, made in the manner of the guild craftsman, would require the use of a metal mold. Since this is not possible, due to the prohibitive cost of the molds to the hobbyist, it is necessary that some other method be practiced. Modern pewtercraft methods for making pewter plates are via the metal-spinning process, the hand-wrought or stake process, and the beating-down process. For homecraft and educational purposes this latter process is considered best for several reasons. First, it is much easier to hold the metal in its proper place; second, the results are much more satisfactory to the amateur craftsman; third, by using a method that will bring satisfaction in the form of a well-made article, and also the satisfaction of realizing that one really can do the work quite easily, there is built up a feeling of confidence in one's ability to accomplish his aims. When poise has been established, and more experience with tools and ma-



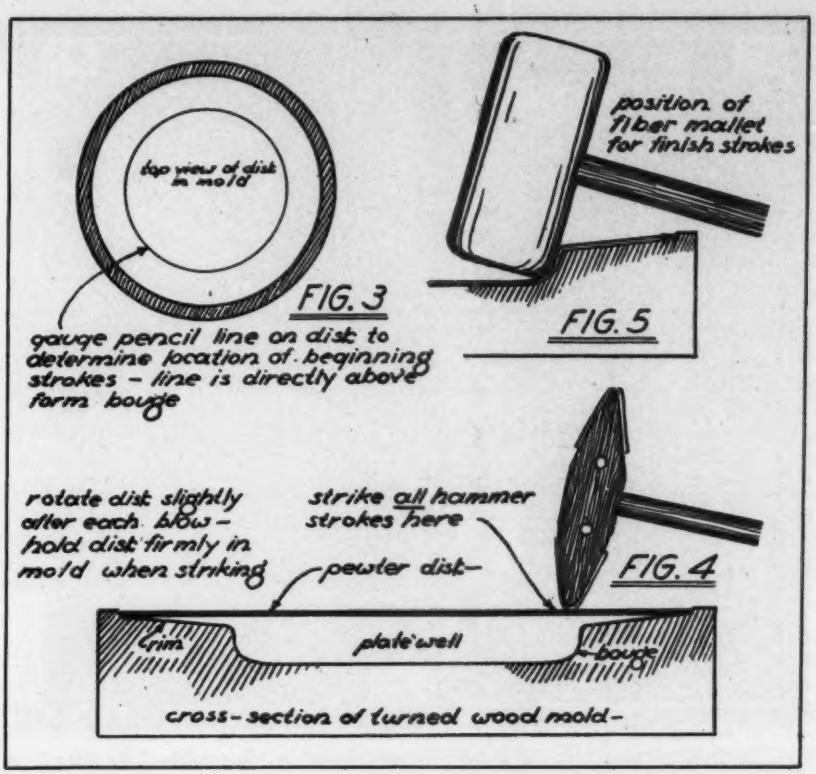
terials has been obtained, then the more difficult processes may be undertaken without much hesitation.

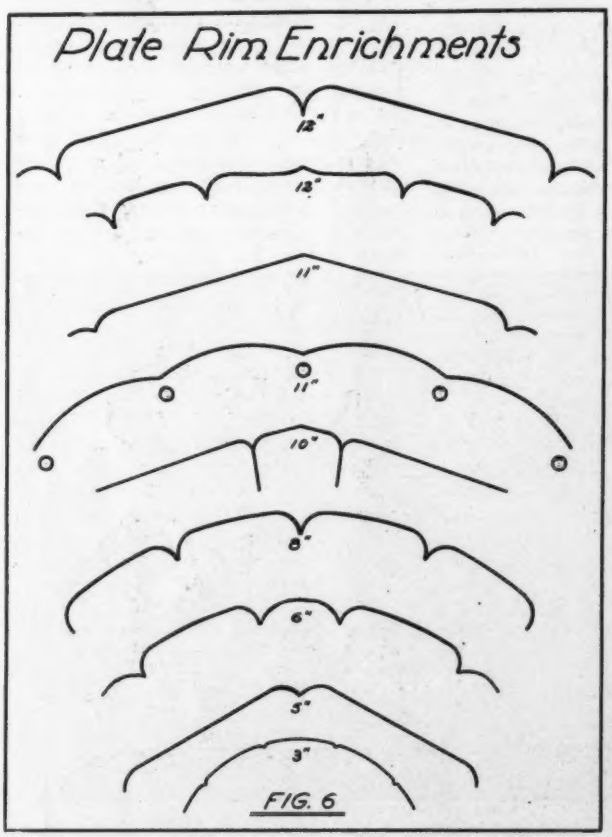
Making a Pewter Plate

Let us assume that an 8-in. salad plate is to be made. Select a piece of kiln-dried birch or maple 1¾ or 2 in. thick and 8½ in. square. Find the center of the block by drawing diagonal lines, and draw an 8½-in. circle. Band-saw to the line, fasten to a faceplate and turn to specifications shown in Figure 2. Finish thoroughly with sandpaper, and shellac or coat with thin linseed oil.

The depth of the plate *well* depends on the use of the plate after it is made. If the plate is designed for serving cakes, cookies, or sandwiches, it should be shallow; if it is to be used for fruit or as a chop plate, it should be deeper. The *bouge*, or curved part of the plate well, and the fiber mallet used in beating down the metal, should have about the same curve. The fiber mallet may be filed to the proper form, or it may be set between the lathe centers, and turned down. The plate *rim* slants toward the center. This slant prevents buckling of the rim when the well is being formed, and it also makes it easier to handle the plate by allowing the fingers to get under the rim when serving.

In starting the beating-down process, mark the disk of metal with a pencil so that the mark will be directly over the center of the bouge or curved part, Figure 3. Set the disk in the mold, hold firmly with one hand, and proceed to hammer lightly until the metal has been seated down to the edge of the well, Figure 4. *Remember that the metal must be stretched, not bent.* After the metal has been well seated, increase the power of the hammer stroke so that the metal will be driven against the wood mold at all places.


top view of disk in mold
FIG. 3
gauge pencil line on disk to determine location of beginning strokes – line is directly above form bouge
position of fiber mallet for finish strokes
FIG. 5
rotate disk slightly after each blow – hold disk firmly in mold when striking
strike all hammer strokes here
pewter disk
FIG. 4
rim
plate well
bouge
cross-section of turned wood mold



If the beating-down process is carried on too long, the metal well of the plate will be deeper than the well of the mold, causing the rim to rise up from the wood mold. To remedy this error partially, turn the plate upside down and hammer the well of the plate around the curved part. This will, in many instances, reseat the plate. In finishing the beating-down process, Figure 5, use light strokes to hammer down all of the little bumps. These bumps can be detected by running the finger around the bouge. When they are found, mark them with a pencil, and then proceed to smooth them. It is possible to get a perfectly smooth bouge, if sufficient time, energy, and patience are used. Do not be too easily satisfied.

Some pewter disks will need a little finishing to remove slight blemishes or scratches. Use old fine emery cloth for this part of the work. New emery cloth will make more scratches. Go over the area that is marred and then finish the whole plate with 3/0 steel wool. The edge of the rim should be filed with a smooth file, emery clothed, and then buffed. Place the edge of the plate on the buffing wheel and keep the plate moving. The speed of the buffing wheel creates enough friction to ruin the plate rim. Try an old piece to determine what friction will do to the edge of a pewter plate.

If the plate is to have a bright finish it may be buffed with tripoli, and then with a rouge. Be sure to remove all traces of tripoli before using the rouge buff. Should an antique finish be desired, dip a pad of 3/0 steel wool or soft cloth in olive oil and then in flour or pumice stone. Rub the plate until the desired effect is obtained.

The process so far has dealt with the making of an 8-in. plate with a plain rim which was characteristic of early European plates and also of many of our own early colonial plates. If it is the plan of the maker to reproduce plates of colonial design there will be little need for enrichment. The plates of that period were very plain, utility being the prime objective. However, if a modern touch is desired, it will be necessary to give the contour or surface some form of enrichment. Contour suggestions are shown in Figure 6. Surface enrichment may be in the form of an overlay design, initials chased, etched, or embossed design. Due to the thickness of the metal required, *repoussé* work should not be attempted on the rim. The center of the plate well offers an excellent area for this treatment.

To divide the rim into equal or odd number of parts, use a drawing board or large piece of cardboard, and draw a series of circles on each side of the board or cardboard. Start with a 4-in. circle and follow with successive diameters up to 12 in. using a common center. Divide the 12-in. circle into 6, 8, 10, 12, or 16 parts, and draw lines from the outer circle to the center, numbering the respective lines to designate their divisions.

On the other side of the board, duplicate the circle, and divide the 12-in. circle into odd parts, such as 5, 7, 9, 11.

The following diameter and gauges are recommended for plate work:

Bread and butter plate	6-in., 18 gauge B&S
Salad plate	8-in., 18 gauge B&S
Dinner plate	10-in., 16 gauge B&S
Chop plate	11 to 12-in., 16 gauge B&S
Ash trays	4 to 5-in., 18 gauge B&S

Problems and Projects

NAPKIN CLIPS

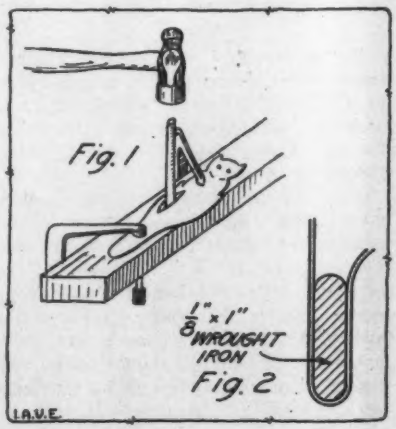
William J. Becker, Boynton Junior High School, Ithaca, New York

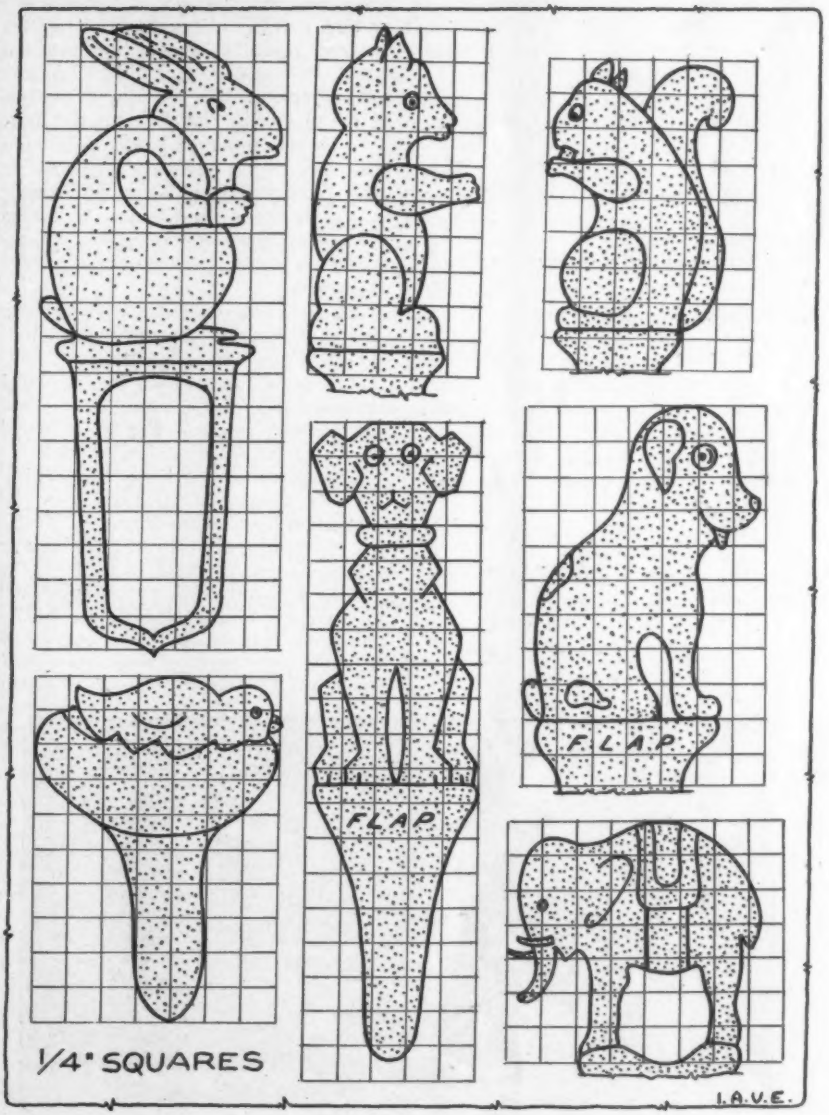
A set of these animal-shaped napkin clips would look very well placed around the dinner table. Made of polished copper or brass, they make an excellent clip for small napkins.

Material required: One piece of 22-gauge brass or copper the size of the design.

Directions:

1. Make bill of material and have it approved by the instructor.
2. Draw the chosen design on squared paper. If you have an original design of your own, use it instead of copying one of the designs given.
3. Have the instructor check your design.
4. Paste the design on a piece of metal.
5. Cut out as much of the design as you can with tin snips.
6. For the remainder, use a jeweler's saw, and cut out the design just outside the line.
7. Smooth the outline with jeweler's files. Get these from the instructor.
8. Clamp the work fast to a flat stake





Suggested designs

for chasing as shown in Figure 1. Ask the instructor to show you how to perform this operation. Practice on a piece of scrap and check with the instructor before starting your good piece.

9. Chase your design, holding the tool as shown in Figure 1.

10. Bend the flap around a piece of 1 by ⅛-in. wrought iron as shown in Figure 2.

11. Clean the job with steel wool. Avoid holding the work with your fingers, otherwise it will be smudged.

12. If the job is to be polished, use a buffer. If it is to be colored (copper, not the brass), place in the liver-of-sulphur solution until the desired color is obtained. Then rinse in water and blot dry (or dry it in the sawdust barrel).

13. Polish lightly with a clean cloth and give a coat of lacquer to preserve finish.

References:

A. Shop display board of napkin clips.

B. *Metal Work,* Jones (Bruce Publishing Co., Milwaukee, Wis.).

C. *School and Home Shop Work,* Schultz and Schultz (Allyn and Bacon, Boston, Mass.).

D. *Essentials of Metal Working,* Berg and Wing (Manual Arts Press, Peoria, Ill.).

E. *Art Metal Work,* Payne (Manual Arts Press, Peoria, Ill.).

F. *Metalwork Essentials,* Tustison and Kranzusch (Bruce Publishing Company, Milwaukee, Wis.).

Questions

1. Which of the two methods for transferring designs to art metal (using carbon paper, or pasting the design on the metal) do you like better? Why?

2. Is rouge ever used as an abrasive on the buffing wheel? Explain (Ref. B., page 50, paragraph 2).

3. Is brass an alloy? Of what metals? (Ref. C., page 193.)

4. Of what metals is the alloy "Babbitt" composed? (Ref. D., page 75.)

5. What did the ancients know of copper, and how did they use this metal? (Ref. E., page 114.)

PORTABLE MULTI-PURPOSE TESTING PANEL

Jesse E. Rathbun, Senior High School, Vallejo, California

The testing panel herewith described not only presents a suitable shop problem but will serve also as a splendid example of integrating schoolwork. A growing demand is being made on shop teachers to develop courses more closely correlated with the other subjects of the school. The problem has been to do this without disrupting the shop courses. Many problems can be developed, such as the testing panel, that will bring the shopwork into a harmonious correlation with many other subjects. This particular problem was developed and completed by a high-school pupil. (The electrical, general shop, mathematic, mechanical drawing, and English classes were utilized to complete the problem.) Equally important is the fact that the pupil's hobby is brought into the school, making such a problem a remarkable example of how interests in and out of school can be brought into harmony.

To develop problems of this type truly makes the boy's education a process of living, and greatly stimulates his interest in schoolwork. If the shop teacher can be the one to motivate this type of education he is scoring another point for his department.

The following suggestions provide one method of approach in developing problems of this nature.

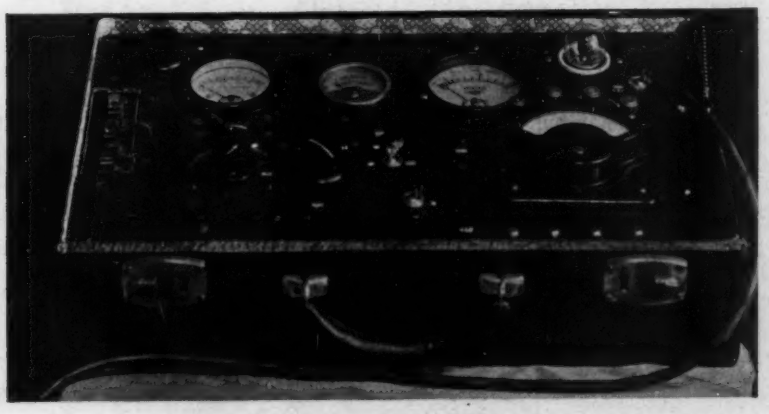
1. Discover the pupil's interests and hobbies outside of school.

2. Aid him in discovering the value of correlating his hobby and schoolwork.

3. Encourage and aid him in establishing some definite objective which can be attained without undue delay.

4. Aid him in making his entire learning situation a normal lifelike activity.

5. Be a major source of inspiration and stimulation in bringing about a harmonious correlation between his home and school activity.



Portable multi-purpose testing panel

The following description and directions, as well as the drawing, were made by Norman Heikes, Vallejo high-school pupil.

The multi-purpose testing panel is designed to meet the average testing requirements of the service electrician. This panel may be cheaply constructed and is compact enough to be carried in a small suitcase. It is equipped to make most of the necessary tests in electrical and radio servicing.

The following tests may be made:

Alternating- and direct-current voltages; 0–10, 0–100, 0–500, and 0–1000.

Direct-current amperage: 0–.1, 0–1.0, and 0–10.

Alternating-current voltage; 0–2 and 0–15.

Resistance in ohms; 0–1000, 0–100,000, and 0–3,000,000.

Capacity in microfarads; .001 to 1.0.

The tester is also equipped with a direct-current neon bulb for testing leaky, open, and shorted condensors.

The meters should be at the top, the switches and adjustments in the middle, and the tip jacks across the bottom, as in the diagram. The "med." and "low" resistance adjustments need not be ganged, if the constructor desires. The separate 0–2 and 0–15 a.c. voltmeters are necessary, as the action of the diode rectifier does not permit accurate a.c. readings below 10 volts. The 4.5-volt battery should be so placed as to facilitate easy removal or replacement. The panel should be constructed of some good insulating material. If wood is used it should be given several coats of shellac to keep out moisture. The ammeter may be provided with external or internal shunts. Its movement is 0–25 milliamperes. The meter rectifier is of the diode type using a '27 or '56 type tube. The rectifier gives a peak a.c. reading on the meter which is higher than the normal a.c. reading. Therefore, if the meter is not already calibrated for a.c., a straight-line graph must be drawn, using some known voltage constant. If the meter scale is not calibrated for resistance, a resistance curve must also be made for each range, using known resistances as constants.

Tests

Before each test, see that all switches are on "off" position, and the negative plug of the test prods in the "—" jack. When each test is finished, return all switches to "off" except the meter switch which should be set at "1000 V."

1. *Direct-current voltage:* Plug prods in "d.c." jack. Adjust meter switch to the next higher voltage than the approximate voltage to be tested. For instance; if the voltage to be tested is known to be approximately 200 to 300 volts, set the meter switch at "500 V." If there is any doubt as to the amount of voltage, start with "1000 V" and work down until a maximum scale deflection is obtained.

TRACING SUPPLEMENT NO. 333, November, 1936
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

LUMBER

COST of LUMBER 1 INCH WIDE

Length		Bd.Ft.	Cost per Foot													
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.04	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.01	.01	.01	.01	.01
1-0	12	.08	.00	.00	.00	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
1-6	18	.13	.00	.01	.01	.01	.01	.01	.01	.01	.01	.02	.02	.02	.02	.02	.02
2-0	24	.17	.00	.01	.01	.01	.01	.01	.02	.02	.02	.02	.02	.02	.03	.03	.03
2-6	30	.21	.00	.01	.01	.01	.01	.02	.02	.02	.02	.03	.03	.03	.03	.03	.04
3-0	36	.25	.00	.01	.01	.02	.02	.02	.02	.03	.03	.03	.03	.04	.04	.04	.04
3-6	42	.29	.00	.01	.01	.02	.02	.02	.03	.03	.03	.04	.04	.04	.04	.05	.05
4-0	48	.33	.00	.01	.02	.02	.02	.03	.03	.03	.04	.04	.04	.05	.05	.05	.06
4-6	54	.38	.00	.02	.02	.02	.03	.03	.03	.04	.04	.05	.05	.05	.06	.06	.06
5-0	60	.42	.00	.02	.02	.03	.03	.03	.04	.04	.05	.05	.05	.06	.06	.07	.07
5-6	66	.46	.00	.02	.02	.03	.03	.04	.04	.05	.05	.06	.06	.06	.07	.07	.08
6-0	72	.50	.00	.02	.03	.03	.04	.04	.05	.05	.06	.06	.07	.07	.08	.08	.09
6-6	78	.54	.00	.02	.03	.03	.04	.04	.05	.05	.06	.07	.07	.08	.08	.09	.09
7-0	84	.58	.00	.02	.03	.04	.04	.05	.05	.06	.06	.07	.08	.08	.09	.09	.10
7-6	90	.63	.00	.03	.03	.04	.04	.05	.06	.06	.07	.08	.08	.09	.09	.10	.11
8-0	96	.67	.00	.03	.03	.04	.05	.05	.06	.07	.07	.08	.09	.09	.10	.11	.11
8-6	102	.71	.00	.03	.04	.04	.05	.06	.06	.07	.08	.09	.09	.10	.11	.11	.12
9-0	108	.75	.00	.03	.04	.05	.05	.06	.07	.08	.08	.09	.10	.11	.11	.12	.13
9-6	114	.79	.00	.03	.04	.05	.06	.06	.07	.08	.09	.10	.10	.11	.12	.13	.13
10-0	120	.83	.00	.03	.04	.05	.06	.07	.08	.08	.09	.10	.11	.12	.13	.13	.14
10-6	126	.88	.00	.04	.04	.05	.06	.07	.08	.09	.10	.11	.11	.12	.13	.14	.15
11-0	132	.92	.00	.04	.05	.06	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16
11-6	138	.96	.00	.04	.05	.06	.07	.08	.09	.10	.11	.12	.12	.13	.14	.15	.16
12-0	144	1.00	.01	.04	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17
12-6	150	1.04	.01	.04	.05	.06	.07	.08	.09	.10	.11	.13	.14	.15	.16	.17	.18
13-0	156	1.08	.01	.04	.05	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17	.18
13-6	162	1.13	.01	.05	.06	.07	.08	.09	.10	.11	.12	.14	.15	.16	.17	.18	.19
14-0	168	1.17	.01	.05	.06	.07	.08	.09	.11	.12	.13	.14	.15	.16	.18	.19	.20
14-6	174	1.21	.01	.05	.06	.07	.08	.10	.11	.12	.13	.15	.16	.17	.18	.19	.21
15-0	180	1.25	.01	.05	.06	.08	.09	.10	.11	.13	.14	.15	.16	.18	.19	.20	.21
15-6	186	1.29	.01	.05	.06	.08	.09	.10	.12	.13	.14	.16	.17	.18	.19	.21	.22
16-0	192	1.33	.01	.05	.07	.08	.09	.11	.12	.13	.15	.16	.17	.19	.20	.21	.23

COST of LUMBER 3 INCHES WIDE

Length		Bd.Ft.	Cost per Foot													
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.13	.00	.01	.01	.01	.01	.01	.01	.01	.01	.02	.02	.02	.02	.02	.02
1-0	12	.25	.00	.01	.01	.02	.02	.02	.02	.03	.03	.03	.03	.04	.04	.04	.04
1-6	18	.38	.00	.02	.02	.02	.03	.03	.03	.04	.04	.05	.05	.05	.06	.06	.06
2-0	24	.50	.00	.02	.03	.03	.04	.04	.05	.05	.06	.06	.07	.07	.08	.08	.09
2-6	30	.63	.00	.03	.03	.04	.04	.05	.06	.06	.07	.08	.08	.09	.09	.10	.11
3-0	36	.75	.00	.03	.04	.05	.05	.06	.07	.08	.08	.09	.10	.11	.11	.12	.13
3-6	42	.88	.00	.04	.04	.05	.06	.07	.08	.09	.10	.11	.11	.12	.13	.14	.15
4-0	48	1.00	.01	.04	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17
4-6	54	1.13	.01	.05	.06	.07	.08	.09	.10	.11	.12	.14	.15	.16	.17	.18	.19
5-0	60	1.25	.01	.05	.06	.08	.09	.10	.11	.13	.14	.15	.16	.18	.19	.20	.21
5-6	66	1.38	.01	.06	.07	.08	.10	.11	.12	.14	.15	.17	.18	.19	.21	.22	.23
6-0	72	1.50	.01	.06	.08	.09	.11	.12	.14	.15	.17	.18	.20	.21	.23	.24	.26
6-6	78	1.63	.01	.07	.08	.10	.11	.13	.15	.16	.18	.20	.21	.23	.24	.26	.28
7-0	84	1.75	.01	.07	.09	.11	.12	.14	.16	.18	.19	.21	.23	.25	.26	.28	.30
7-6	90	1.88	.01	.08	.09	.11	.13	.15	.17	.19	.21	.23	.24	.26	.28	.30	.32
8-0	96	2.00	.01	.08	.10	.12	.14	.16	.18	.20	.22	.24	.26	.28	.30	.32	.34
8-6	102	2.13	.01	.09	.11	.13	.15	.17	.19	.21	.23	.26	.28	.30	.32	.34	.36
9-0	108	2.25	.01	.09	.11	.14	.16	.18	.20	.23	.25	.27	.29	.32	.34	.36	.38
9-6	114	2.38	.01	.10	.12	.14	.17	.19	.21	.24	.26	.29	.31	.33	.36	.38	.40

R CHART

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COST of LUMBER 2 INCHES WIDE

Length		Bd.Ft.	Cost per Foot														
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.08	.00	.00	.00	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
1-0	12	.17	.00	.01	.01	.01	.01	.01	.02	.02	.02	.02	.02	.02	.03	.03	.03
1-6	18	.25	.00	.01	.01	.02	.02	.02	.02	.03	.03	.03	.03	.04	.04	.04	.04
2-0	24	.33	.00	.01	.02	.02	.02	.03	.03	.03	.04	.04	.04	.05	.05	.05	.06
2-6	30	.42	.00	.02	.02	.03	.03	.03	.04	.04	.05	.05	.05	.06	.06	.07	.07
3-0	36	.50	.00	.02	.03	.03	.04	.04	.05	.05	.06	.06	.07	.07	.08	.08	.09
3-6	42	.58	.00	.02	.03	.04	.04	.05	.05	.06	.06	.07	.08	.08	.09	.09	.10
4-0	48	.67	.00	.03	.03	.04	.05	.05	.06	.07	.07	.08	.09	.09	.10	.11	.11
4-6	54	.75	.00	.03	.04	.05	.05	.06	.07	.08	.08	.09	.10	.11	.11	.12	.13
5-0	60	.83	.00	.03	.04	.05	.06	.07	.08	.08	.09	.10	.11	.12	.13	.13	.14
5-6	66	.92	.00	.04	.05	.06	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16
6-0	72	1.00	.01	.04	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17
6-6	78	1.08	.01	.04	.05	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17	.18
7-0	84	1.17	.01	.05	.06	.07	.08	.09	.11	.12	.13	.14	.15	.16	.18	.19	.20
7-6	90	1.25	.01	.05	.06	.08	.09	.10	.11	.13	.14	.15	.16	.18	.19	.20	.21
8-0	96	1.33	.01	.05	.07	.08	.09	.11	.12	.13	.15	.16	.17	.19	.20	.21	.23
8-6	102	1.42	.01	.06	.07	.09	.10	.11	.13	.14	.16	.17	.18	.20	.21	.23	.24
9-0	108	1.50	.01	.06	.08	.09	.11	.12	.14	.15	.17	.18	.20	.21	.23	.24	.26
9-6	114	1.58	.01	.06	.08	.10	.11	.13	.14	.16	.17	.19	.21	.22	.24	.25	.27
10-0	120	1.67	.01	.07	.08	.10	.12	.13	.15	.17	.18	.20	.22	.23	.25	.27	.28
10-6	126	1.75	.01	.07	.09	.11	.12	.14	.16	.18	.19	.21	.23	.25	.26	.28	.30
11-0	132	1.83	.01	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28	.29	.31
11-6	138	1.92	.01	.08	.10	.12	.13	.15	.17	.19	.21	.23	.25	.27	.29	.31	.33
12-0	144	2.00	.01	.08	.10	.12	.14	.16	.18	.20	.22	.24	.26	.28	.30	.32	.34
12-6	150	2.08	.01	.08	.10	.13	.15	.17	.19	.21	.23	.25	.27	.29	.31	.33	.35
13-0	156	2.17	.01	.09	.11	.13	.15	.17	.20	.22	.24	.26	.28	.30	.33	.35	.37
13-6	162	2.25	.01	.09	.11	.14	.16	.18	.20	.23	.25	.27	.29	.31	.34	.36	.38
14-0	168	2.33	.01	.09	.12	.14	.16	.19	.21	.23	.26	.28	.30	.33	.35	.37	.40
14-6	174	2.42	.01	.10	.12	.15	.17	.19	.22	.24	.27	.29	.31	.34	.36	.39	.41
15-0	180	2.50	.01	.10	.13	.15	.18	.20	.23	.25	.28	.30	.33	.35	.38	.40	.43
15-6	186	2.58	.01	.10	.13	.16	.18	.21	.23	.26	.28	.31	.34	.36	.39	.41	.44
16-0	192	2.67	.01	.11	.13	.16	.19	.21	.24	.27	.29	.32	.35	.37	.40	.43	.45

COST of LUMBER 4 INCHES WIDE

Length		Bd.Ft.	Cost per Foot														
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.17	.00	.01	.01	.01	.01	.01	.02	.02	.02	.02	.02	.02	.03	.03	.03
1-0	12	.33	.00	.01	.02	.02	.02	.03	.03	.03	.04	.04	.04	.05	.05	.05	.06
1-6	18	.50	.00	.02	.03	.03	.04	.04	.05	.05	.06	.06	.07	.07	.08	.08	.09
2-0	24	.67	.00	.03	.03	.04	.05	.05	.06	.07	.07	.08	.09	.09	.10	.11	.11
2-6	30	.83	.00	.03	.04	.05	.06	.07	.08	.08	.09	.10	.11	.12	.13	.13	.14
3-0	36	1.00	.01	.04	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17
3-6	42	1.17	.01	.05	.06	.07	.08	.09	.11	.12	.13	.14	.15	.16	.18	.19	.20
4-0	48	1.33	.01	.05	.07	.08	.09	.11	.12	.13	.15	.16	.17	.19	.20	.21	.23
4-6	54	1.50	.01	.06	.08	.09	.11	.12	.14	.15	.17	.18	.20	.21	.23	.24	.26
5-0	60	1.67	.01	.07	.08	.10	.12	.13	.15	.17	.18	.20	.22	.23	.25	.27	.28
5-6	66	1.83	.01	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28	.29	.31
6-0	72	2.00	.01	.08	.10	.12	.14	.16	.18	.20	.22	.24	.26	.28	.30	.32	.34
6-6	78	2.17	.01	.09	.11	.13	.15	.17	.20	.22	.24	.26	.28	.30	.33	.35	.37
7-0	84	2.33	.01	.09	.12	.14	.16	.19	.21	.23	.26	.28	.30	.33	.35	.37	.40
7-6	90	2.50	.01	.10	.13	.15	.18	.20	.23	.25	.28	.30	.33	.35	.38	.40	.43
8-0	96	2.67	.01	.11	.13	.16	.19	.21	.24	.27	.29	.32	.35	.37	.40	.43	.45
8-6	102	2.83	.01	.11	.14	.17	.20	.23	.26	.28	.31	.34	.37	.40	.43	.45	.48
9-0	108	3.00	.02	.12	.15	.18	.21	.24	.27	.30	.33	.36	.39	.42	.45	.48	.51
9-6	114	3.17	.02	.13	.16	.19	.22	.25	.29	.32	.35	.38	.41	.44	.48	.51	.54

10-0	120	2.50	.01	.10	.13	.15	.18	.20	.23	.25	.28	.30	.33	.35	.38	.40
10-6	126	2.63	.01	.11	.13	.16	.18	.21	.24	.26	.29	.32	.34	.37	.39	.42	.45
11-0	132	2.75	.01	.11	.14	.17	.19	.22	.25	.28	.30	.33	.36	.39	.41	.44	.47
11-6	138	2.88	.01	.12	.14	.17	.20	.23	.26	.29	.32	.35	.37	.40	.43	.46	.49
12-0	144	3.00	.02	.12	.15	.18	.21	.24	.27	.30	.33	.36	.39	.42	.45	.48	.51
12-6	150	3.13	.02	.13	.16	.19	.22	.25	.28	.31	.34	.38	.41	.44	.47	.50	.53
13-0	156	3.25	.02	.13	.16	.20	.23	.26	.29	.33	.36	.39	.42	.46	.49	.52	.55
13-6	162	3.38	.02	.14	.17	.20	.24	.27	.30	.34	.37	.41	.44	.47	.51	.54	.57
14-0	168	3.50	.02	.14	.18	.21	.25	.28	.32	.35	.39	.42	.46	.49	.53	.56	.60
14-6	174	3.63	.02	.15	.18	.22	.25	.29	.33	.36	.40	.44	.47	.51	.54	.58	.62
15-0	180	3.75	.02	.15	.19	.23	.26	.30	.34	.38	.41	.45	.49	.53	.56	.60	.64
15-6	186	3.88	.02	.16	.19	.23	.27	.31	.35	.39	.43	.47	.50	.54	.58	.62	.66
16-0	192	4.00	.02	.16	.20	.24	.28	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68

COST of LUMBER 5 INCHES WIDE

Length		Bd.Ft.	Cost per Foot														
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.21	.00	.01	.01	.01	.01	.02	.02	.02	.02	.03	.03	.03	.03	.03	.04
1-0	12	.42	.00	.02	.02	.03	.03	.03	.04	.04	.05	.05	.05	.06	.06	.07	.07
1-6	18	.63	.00	.03	.03	.04	.04	.05	.06	.06	.07	.08	.08	.09	.09	.10	.11
2-0	24	.83	.00	.03	.04	.05	.06	.07	.08	.08	.09	.10	.11	.12	.13	.13	.14
2-6	30	1.04	.01	.04	.05	.06	.07	.08	.09	.10	.11	.13	.14	.15	.16	.17	.18
3-0	36	1.25	.01	.05	.06	.08	.09	.10	.11	.13	.14	.15	.16	.18	.19	.20	.21
3-6	42	1.46	.01	.06	.07	.09	.10	.12	.13	.15	.16	.18	.19	.20	.22	.23	.25
4-0	48	1.67	.01	.07	.08	.10	.12	.	.15	.17	.18	.20	.22	.23	.25	.27	.28
4-6	54	1.88	.01	.08	.09	.11	.13	.	.17	.19	.21	.23	.24	.26	.28	.30	.32
5-0	60	2.08	.01	.08	.10	.13	.15	.	.19	.21	.23	.25	.27	.29	.31	.33	.35
5-6	66	2.29	.01	.09	.11	.14	.16	.18	.21	.23	.25	.28	.30	.32	.34	.37	.39
6-0	72	2.50	.01	.10	.13	.15	.18	.20	.23	.25	.28	.30	.33	.35	.38	.40	.43
6-6	78	2.71	.01	.11	.14	.16	.19	.22	.24	.27	.30	.33	.35	.38	.41	.43	.46
7-0	84	2.92	.01	.12	.15	.18	.20	.23	.26	.29	.32	.35	.38	.41	.44	.47	.50
7-6	90	3.13	.02	.13	.16	.19	.22	.25	.28	.31	.34	.38	.41	.44	.47	.50	.53
8-0	96	3.33	.02	.13	.17	.20	.23	.27	.30	.33	.37	.40	.43	.47	.50	.53	.57
8-6	102	3.54	.02	.14	.18	.21	.25	.28	.32	.35	.39	.43	.46	.50	.53	.57	.60
9-0	108	3.75	.02	.15	.19	.23	.26	.30	.34	.38	.41	.45	.49	.53	.56	.60	.64
9-6	114	3.96	.02	.16	.20	.24	.28	.32	.36	.40	.44	.48	.51	.55	.59	.63	.67
10-0	120	4.17	.02	.17	.21	.25	.29	.33	.38	.42	.46	.50	.54	.58	.63	.67	.71
10-6	126	4.37	.02	.18	.22	.26	.31	.35	.39	.44	.48	.53	.57	.61	.66	.70	.74
11-0	132	4.58	.02	.18	.23	.28	.32	.37	.41	.46	.50	.55	.60	.64	.69	.73	.78
11-6	138	4.79	.02	.19	.24	.29	.34	.38	.43	.48	.53	.58	.62	.67	.72	.77	.81
12-0	144	5.00	.03	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85
12-6	150	5.21	.03	.21	.26	.31	.36	.42	.47	.52	.57	.63	.68	.73	.78	.83	.89
13-0	156	5.42	.03	.22	.27	.33	.38	.43	.49	.54	.60	.65	.70	.76	.81	.87	.92
13-6	162	5.63	.03	.23	.28	.34	.39	.45	.51	.56	.62	.68	.73	.79	.84	.90	.96
14-0	168	5.83	.03	.23	.29	.35	.41	.47	.53	.58	.64	.70	.76	.82	.88	.93	.99
14-6	174	6.04	.03	.24	.30	.36	.42	.48	.54	.60	.66	.73	.79	.85	.91	.97	1.03
15-0	180	6.25	.03	.25	.31	.38	.44	.50	.56	.63	.69	.75	.81	.88	.94	1.00	1.06
15-6	186	6.46	.03	.26	.32	.39	.45	.52	.58	.65	.71	.78	.84	.90	.97	1.03	1.10
16-0	192	6.67	.03	.27	.33	.40	.47	.53	.60	.67	.73	.80	.87	.93	1.00	1.07	1.13

These tables have been calculated for lumber 1 in. thick. Another group of six tables will appear next month. They have been carefully calculated and checked and it is hoped that they will take the drudgery out of lumber-cost calculation.

To find the cost of lumber t
tiply the quantities, taken from t
thickness. Thus, for lumber 3 in
price from the table by 3; for 4-

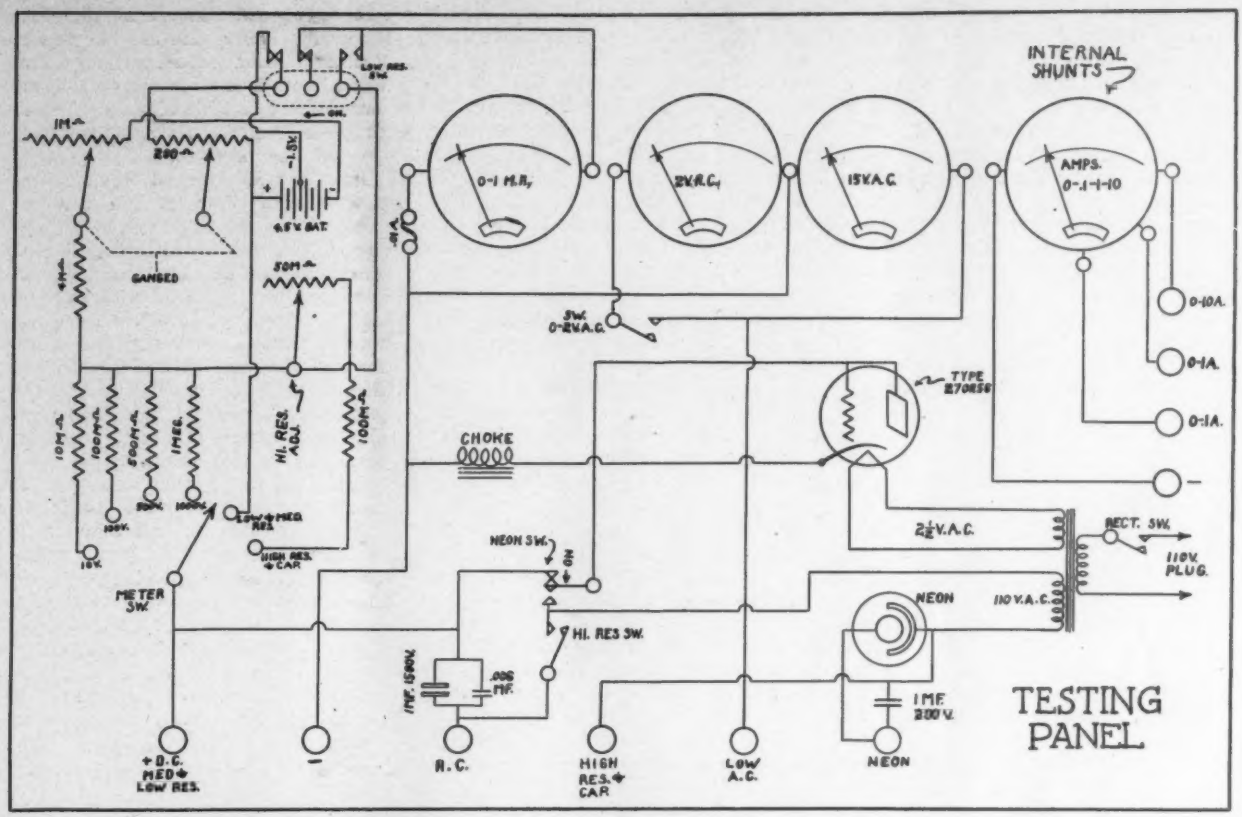
For prices per foot not on t

10-6	126	3.50	.02	.14	.18	.21	.25	.28	.32	.35	.39	.42	.46	.49	.53	.56	.60
11-0	132	3.67	.02	.15	.18	.22	.26	.29	.33	.37	.40	.44	.48	.51	.55	.59	.62
11-6	138	3.83	.02	.15	.19	.23	.27	.31	.35	.38	.42	.46	.50	.54	.58	.61	.65
12-0	144	4.00	.02	.16	.20	.24	.28	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68
12-6	150	4.17	.02	.17	.21	.25	.29	.33	.38	.42	.46	.50	.54	.58	.63	.67	.71
13-0	156	4.33	.02	.17	.22	.26	.30	.35	.39	.43	.48	.52	.56	.61	.65	.69	.74
13-6	162	4.50	.02	.18	.23	.27	.32	.36	.41	.45	.50	.54	.59	.63	.68	.72	.77
14-0	168	4.67	.02	.19	.23	.28	.33	.37	.42	.47	.51	.56	.61	.65	.70	.75	.79
14-6	174	4.83	.02	.19	.24	.29	.34	.39	.44	.48	.53	.58	.63	.68	.73	.77	.82
15-0	180	5.00	.03	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85
15-6	186	5.17	.03	.21	.26	.31	.36	.41	.47	.52	.57	.62	.67	.72	.78	.83	.88
16-0	192	5.33	.03	.21	.27	.32	.37	.43	.48	.53	.59	.64	.69	.75	.80	.85	.91

COST of LUMBER 6 INCHES WIDE

Length		Bd.Ft.	Cost per Foot														
Ft.-In.	In.		½¢	4¢	5¢	6¢	7¢	8¢	9¢	10¢	11¢	12¢	13¢	14¢	15¢	16¢	17¢
0-6	6	.25	.00	.01	.01	.02	.02	.02	.02	.03	.03	.03	.03	.04	.04	.04	.04
1-0	12	.50	.01	.02	.03	.03	.04	.04	.05	.05	.06	.06	.07	.07	.08	.08	.09
1-6	18	.75	.01	.03	.04	.05	.05	.06	.07	.08	.08	.09	.10	.11	.11	.12	.13
2-0	24	1.00	.01	.04	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17
2-6	30	1.25	.01	.05	.06	.08	.09	.10	.11	.13	.14	.15	.16	.18	.19	.20	.21
3-0	36	1.50	.02	.06	.08	.09	.11	.12	.14	.15	.17	.18	.20	.21	.23	.24	.26
3-6	42	1.75	.02	.07	.09	.11	.12	.14	.16	.18	.19	.21	.23	.25	.26	.28	.30
4-0	48	2.00	.02	.08	.10	.12	.14	.16	.18	.20	.22	.24	.26	.28	.30	.32	.34
4-6	54	2.25	.02	.09	.11	.14	.16	.18	.20	.23	.25	.27	.29	.32	.34	.36	.38
5-0	60	2.50	.03	.10	.13	.15	.18	.20	.23	.25	.28	.30	.33	.35	.38	.40	.43
5-6	66	2.75	.03	.11	.14	.17	.19	.22	.25	.28	.30	.33	.36	.39	.41	.44	.47
6-0	72	3.00	.03	.12	.15	.18	.21	.24	.27	.30	.33	.36	.39	.42	.45	.48	.51
6-6	78	3.25	.03	.13	.16	.20	.23	.26	.29	.33	.36	.39	.42	.46	.49	.52	.55
7-0	84	3.50	.04	.14	.18	.21	.25	.28	.32	.35	.39	.42	.46	.49	.53	.56	.60
7-6	90	3.75	.04	.15	.19	.23	.26	.30	.34	.38	.41	.45	.49	.53	.56	.60	.64
8-0	96	4.00	.04	.16	.20	.24	.28	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68
8-6	102	4.25	.04	.17	.21	.26	.30	.34	.38	.43	.47	.51	.55	.60	.64	.68	.72
9-0	108	4.50	.05	.18	.23	.27	.32	.36	.41	.45	.50	.54	.59	.63	.68	.72	.77
9-6	114	4.75	.05	.19	.24	.29	.33	.38	.43	.48	.52	.57	.62	.67	.71	.76	.81
10-0	120	5.00	.05	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85
10-6	126	5.25	.05	.21	.26	.32	.37	.42	.47	.53	.58	.63	.68	.74	.79	.84	.89
11-0	132	5.50	.06	.22	.28	.33	.39	.44	.50	.55	.61	.66	.72	.77	.83	.88	.94
11-6	138	5.75	.06	.23	.29	.35	.40	.46	.52	.58	.63	.69	.75	.81	.86	.92	.98
12-0	144	6.00	.06	.24	.30	.36	.42	.48	.54	.60	.66	.72	.78	.84	.90	.96	1.02
12-6	150	6.25	.06	.25	.31	.38	.44	.50	.56	.63	.69	.75	.81	.88	.94	1.00	1.06
13-0	156	6.50	.07	.26	.33	.39	.46	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11
13-6	162	6.75	.07	.27	.34	.41	.47	.54	.61	.68	.74	.81	.88	.95	1.01	1.08	1.15
14-0	168	7.00	.07	.28	.35	.42	.49	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19
14-6	174	7.25	.07	.29	.36	.44	.51	.58	.65	.73	.80	.87	.94	1.02	1.09	1.16	1.23
15-0	180	7.50	.08	.30	.38	.45	.53	.60	.68	.75	.83	.90	.98	1.05	1.13	1.20	1.28
15-6	186	7.75	.08	.31	.39	.47	.54	.62	.70	.78	.85	.93	1.01	1.09	1.16	1.24	1.32
16-0	192	8.00	.08	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36

f lumber thicker than 1 in., multiken from the table, by the desired umber 3 in. thick, multiply the 3; for 4-in. lumber, by 4, etc. t not on the chart, add together the quantities obtained from two or more columns found on this chart. Thus, for lumber at 23 cents per foot, add the amounts taken from the 11 and 12-cent columns; for 35-cent lumber, add the quantities taken from the 17 and ½-cent columns, and multiply the result by 2.



Wiring diagram for multi-purpose testing panel

2. *Alternating current:* Plug prods in "a.c." jack. Turn the rectifier. Switch to "on." Plug in the 110-volt cord, and adjust the meter switch as in No. 1.

3. *Low resistance:* (0–1000 ohms). Plug prods in "d.c." jack. Turn low resistance switch to "med." and "low." Touch prods and adjust the low-resistance adjustment until a full scale deflection is obtained on the meter.

4. *Medium resistance:* (0–100,000 ohms). Plug prods into "d.c." jack. Turn meter switch to "med." and "low." Touch prods together, and adjust the medium resistance adjustment to a full scale deflection on the meter.

5. *High resistance:* (0–4,000,000 ohms). Plug prods in "high resistance" jack. Turn high-resistance and rectifier switches to "on," and meter switch to "high resistance." Plug in 110-volt cord. Touch prods together, and adjust the high resistance adjustment to a full scale deflection on the meter.

6. *Capacity:* (.001 to 1.0 mfd.) same as No. 5.

7. *Condensor shorts, leaks, and opens:* Plug rods in "neon" jack. Turn neon and rectifier switches to "on." Plug cord in 110-volt line. Shorted or leaky — bright flash. Good — intermittent flashes. Open — no flash.

MAKING CARVING TOOLS FROM OLD FILES

Leigh M. Nason, Student, Ohio State University, Columbus, Ohio

Woodcarving is a fascinating form of artistic effort. Many people hesitate to interest themselves in it, however, because of the initial cost of a good set of tools. The purpose of this article is to show how carving tools may be made out of old files, which will cost little, but will make good serviceable tools.

The steps to be followed are:

1. *Choosing the proper files*

Choose files that are fairly close to the desired shape. A three-cornered file will do for straight flat chisels and some of the smaller bent gouges. For large chisels, use half-round files and flat files. Be very sure that the files are of good quality, such as Nicholson, Atkins, Simonds, or similar makes. Five-and-ten-cent-store files usually are not of satisfactory quality.

2. *Anneal the file and grind off serrations*

The file must be annealed before it can be shaped. Place it in the forge or furnace and heat it to a bright red. Then allow it

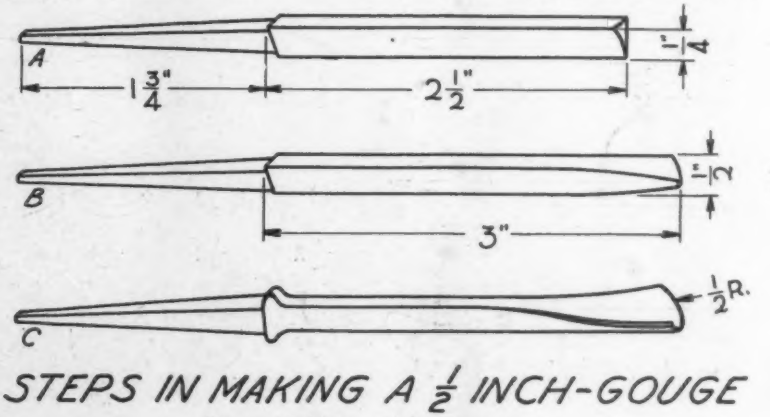


Fig. 1. Making a ½-in. gouge

to *cool slowly*. There are several ways to do this. If you are using a forge, leave the file in the fire and bank it with coal, or place it in a box of finely ground asbestos. The same can be done if a gas furnace is being used. When the file is cold, grind off the serrations. Experience has shown that forging will flatten them down but will not remove them. It is easier to do the grinding after annealing.

3. *Forge the tool to shape*

Heat the file to a bright red again and draw it down to the required shape on the anvil. Be careful not to continue forging after the metal turns dark. The allowable range of forging temperature is rather small for steel, and it will be necessary to reheat the tool a number of times. The file is usually too long for the tool desired and so must be cut off with the hardy or with a cold chisel. Bear in mind that the forging process will also lengthen the tool. It is wise to select a file which requires considerable drawing out for at least two reasons. First, forging, properly done, improves the grain of the steel. Second, in drawing out the tool, a larger collar should be left at the shank to take the thrust against the handle. I would suggest that none of the tools be made very long. Shorter tools are easier to work with and if one wears out, a new one can be quickly made. It is not necessary to forge the tool exactly to size as there is the grinder and the hand file to fall back on.

4. *Dress to exact size with grinder and file*

How much grinding and filing must be done depends on how nice a shape and finish is wanted. For grinding the inside of the gauges use round-nosed wheels like those used for gumming saws. Some very useful gouges can be made by simply flattening out the end of a three-cornered file and bending it to the radius desired. The concave part must then be dressed with a round or half-round file. The steps in the process are shown at A, B, and C, in Figure 1. Leave the edge of the tool at least 1/32 in. thick until after hardening.

5. *Harden and draw*

To harden the tool, heat it slowly and uniformly to a cherry red. Have a good-sized pail of water close at hand. Then, when the temperature is uniform, plunge the cutting edge into the water. If the water is too far away, the edge will cool below the hardening temperature before the tool strikes the water. A test with a good sharp file will show you if the tool is hard. If it isn't, put it back into the fire and get it a little hotter before quenching. If the file will not cut the metal, it is too hard to be used as a wood tool. To correct this, it will be necessary to draw out part of the hardness. To do this, first polish the tool with emery cloth, then heat the shank red-hot. As the heat is conducted toward the cold end, a band of colors represents a different degree of hardness. Watch the colors closely as they move toward the cutting edge. A dark straw color merging into a deep purple is the proper color for a carving tool. When this color reaches the edge, cool the tool in water to stop any further drawing. It is now ready for the final operation.

6. *Grind and hone cutting edge*

An edge 1/32 in. thick was left on the tool to prevent burning in the furnace. It now remains to reduce this to as close to zero as possible. Most of it can be ground off if care and judgment are exercised. As the edge gets thinner, the heat of grinding tends to draw the temper of the steel. A good method to follow in grinding a cutting edge on a carving tool is first to hone the end of the tool at right angles to the cutting edge. This produces a bright surface on the edge (which has to be removed), so it can easily be seen when held at the proper angle. Next, grind the tool, holding it so as to give a cutting angle of about 15 deg. Don't use too much pressure. Dip it into the water frequently. Watch the burnished edge and keep it the same thickness across the whole width of the tool. This is easy to do with a flat chisel but more difficult with a gouge. When the burnished edge is so that it can just be seen, the remainder must be removed with an oilstone or a slip stone. One or two slip stones are necessary for finishing the gouges. It also is a good plan to have two oilstones, one for the gouges and narrow chisels, and one for the wide ones. It is hard to keep from wearing hollow spots in an oilstone while honing gouges. For ease of handling, it is a good idea to drive on the handle before honing.

7. *General consideration*

Now for a few "general considerations." If you have no worn-out files, go to your local saw filer. He will be glad to sell you all you want for not more than a nickel apiece. If you do not have a furnace, make one. Get some fire brick and build a little narrow box. Shoot the flame from a gasoline blowtorch into it. It is a little slower than a forge but it will do the work. If you are worried about hardening temperatures, heat some test pieces and quench them until you are sure of the right temperature. Do the same for practice in drawing. If you have a lathe, you can turn fancy and distinctive handles for yourself. Ferrules can be made from ½-in. copper or brass tubing. Figure 2 shows a few types of carving tools that are easy to make. After you have been carving for a while, you will have a lot of ideas about special types of tools you want, and the beauty of it is that you will know how to get them. The set shown in Figure 2 will be sufficient for ordinary carving requirements.

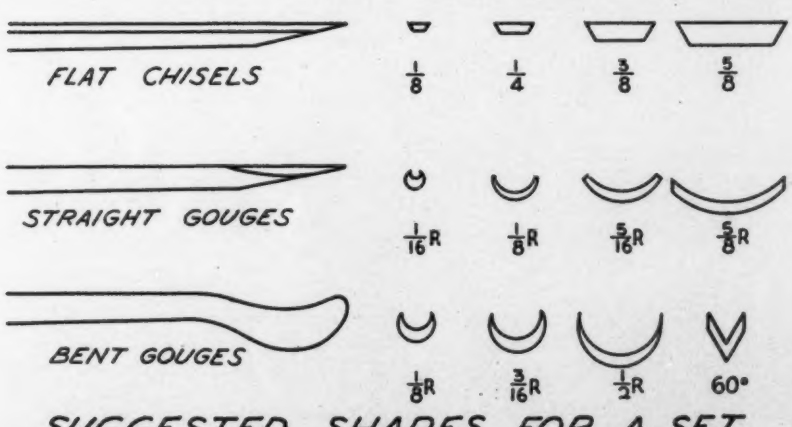
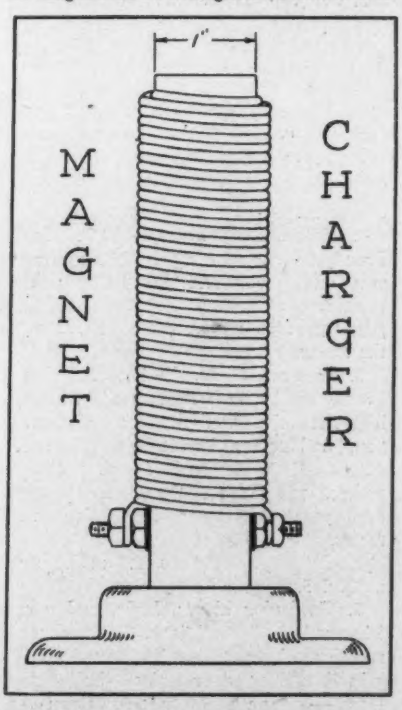


Fig. 2. Chisels and gouges that the carver may want

MAGNET CHARGER

S. O. Werner, State Teachers College, Santa Barbara, California

Permanent straight or U magnets may be magnetized or remagnetized with a solenoid-type charger which can easily be built in the school shop.



Materials

1-in. pipe flange, base 3½ in. diameter.

1 piece of 1-in. brass tubing 6 in. long (inside diameter should not be less than ⅞ in.)

26 ft. No. 12 B. S. gauge insulated magnet wire.

2 No. 8-32 by ¾ in. r.h. brass machine screws.

4 No. 8-32 hex. brass machine nuts.

Insulating washers.

Shellac, paint (optional).

Procedure

1. Thread end of tube to fit into flange.
2. Drill ⅛-in. holes for machine screws directly opposite each other, 1½ in. from the threaded end.
3. Put in screws (head of screw on inside; insulate the screws from wall of tube).
4. Fasten one end of bared wire to one of the terminals and tighten nut.
5. Wind two layers of 40 turns each on the tube and fasten end to the remaining terminal.

Note: If cotton-covered wire is used, it is advisable to give the coil a coat or two of shellac, and, if it seems advisable, follow that with a coat of paint.

Charging Magnet

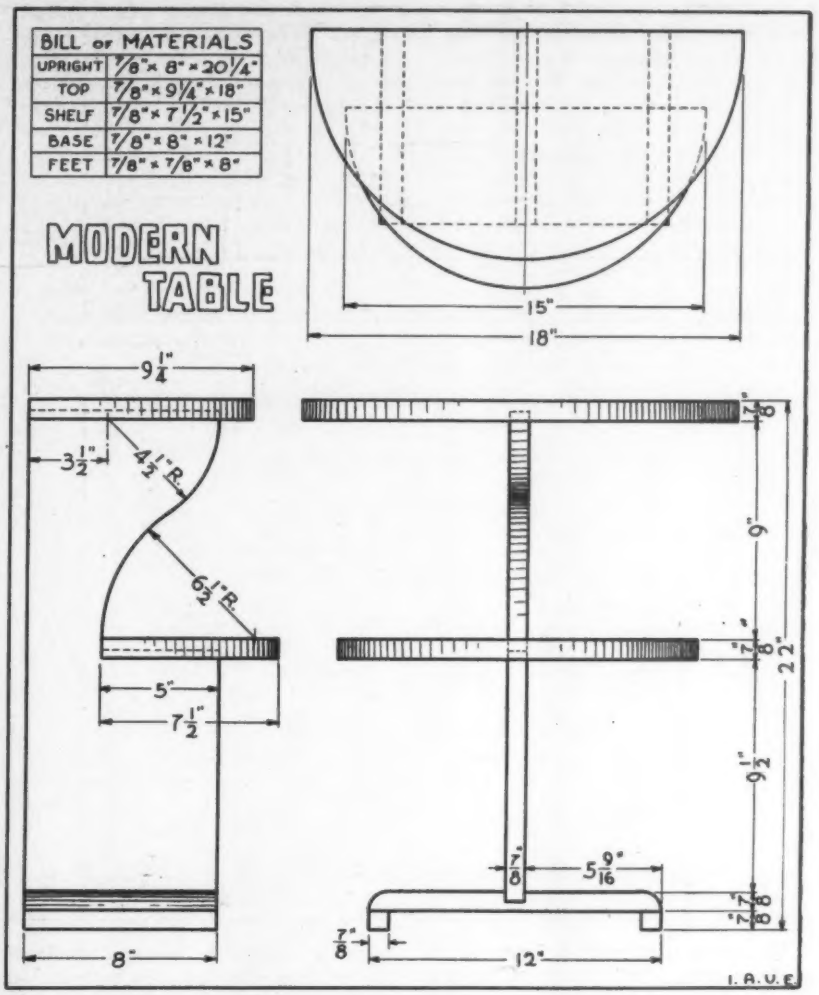
Using 6-volt direct current (from ordinary car battery), connect one lead from the battery to one terminal of the charger. Insert one leg of the magnet in the solenoid and charge same by tapping other terminal several times with the other lead.

Caution: Be sure that the circuit is closed only momentarily, as a steady current through the coil for only a short time would heat the coil excessively.

MODERNISTIC TABLE

Matthew L. Brady, Peshine Avenue School, Newark, New Jersey

Here is a modern table that may be used as an occasional, or console table. It may be constructed of basswood, whitewood, or walnut. If made of either of the first two, it should be painted in color combinations such as red and gold or black and silver. If made of walnut it may be given a natural finish and the edges trimmed with a black lacquer.



Procedure

Base

1. Square base to size and cut dado joint.
2. Cut feet to size.
3. Glue and clamp feet to both ends of base.
4. Lay out and plane quarter-round ends of base.
5. Sand.

Upright

1. Square upright to size.
2. Lay out and cut to shape (care should be taken to keep support for first shelf straight and square).
3. Sand.

First Shelf

1. Square edge.
2. Scribe semicircle and cut.
3. Lay out and cut dado joint.
4. Surface top.
5. Sand.

Top

1. Square edge.
2. Scribe semicircle and cut to size.
3. Lay out and cut dado joint.
4. Surface top.
5. Sand.

Assemble

1. Glue and clamp upright to base.
2. Glue and clamp first shelf to upright.
3. Glue and clamp top in place.

Finish

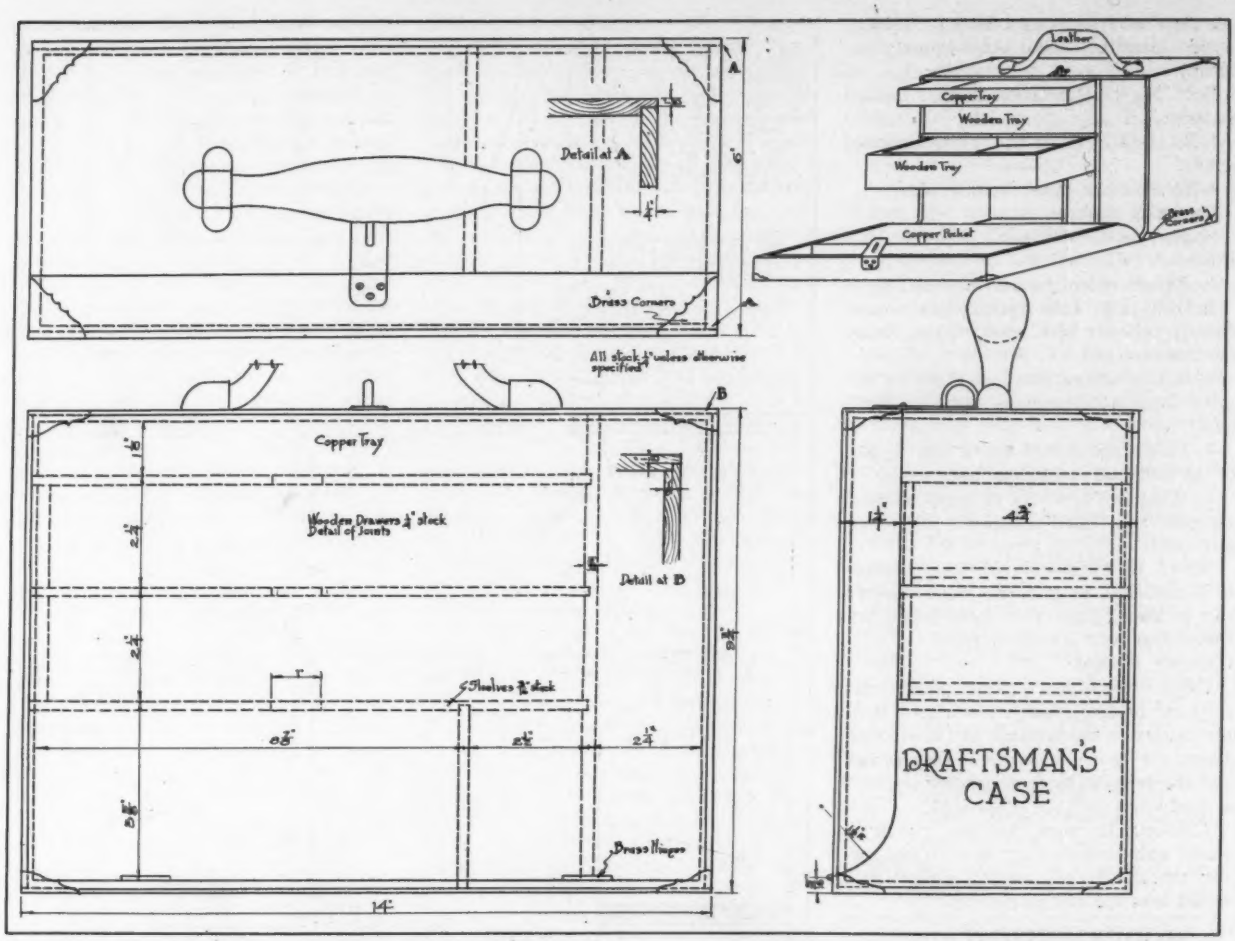
1. Sand.
2. Shellac.
3. Steel wool No. 0.
4. Lacquer.
5. Trim edges (silver or gold).

DRAFTSMAN'S CASE

J. E. Ray, The Stout Institute, Menomonie, Wisconsin

This neat, compact, accessible draftsman's case was designed after three or four attempts at different sizes and shapes. After four or five years of daily use, it has been found quite ideal in every way.

It doesn't take much room, and it may be set anywhere and always presents a neat appearance. It holds a drawing case, five or six handbooks, one field notebook, three or four scales, inks, pens, brushes, paints, small pocket drawing case, tape, 2-ft. rule, two boxes of drawing pencils, proportional dividers, magnifying glass, hand punch, and triangles.



The top tray is made of copper. It is used for pens, pencils, thumb tacks, and lettering devices that are used more or less daily.

The second drawer is made of wood and is used for heavier and more bulky things, such as brushes, paints, dividers, large detail pens, and lettering pens.

The third drawer is made of wood and is used for materials, keys, whetstone for sharpening ruling pens, rubber stamps used in checking and stamping drawings, colored crayons for rendering drawings and perspectives, 30-in. steel tape, Pazant pens, and erasers.

Below the drawers, the large drawing set is kept, 2 boxes of pencils, field notebook, and some lettering pamphlets, also two bottles of drawing inks. The hand punch is kept in this space also.

The right vertical space is used for handbooks. I have packed in here six "Building Trades Handbooks" and a draftsman's apron. In the bottom of the case a 12-in. triangular rule is kept.

The cover is made large enough to hold all the triangles and extra flat scales, and a slide rule. The copper pocket keeps these in their proper places. When the case is closed, there is enough room to put in a dozen or more 8½ by 11-in. sheets of paper, some drawings, specifications, or other current data. In the top of the case, I have two or three cards with handy tables, decimal equivalents, and the like.

With a good substantial hasp and lock on this case, one may keep his supplies and equipment handy, and the whole outfit is quite portable and can be easily moved from place to place.

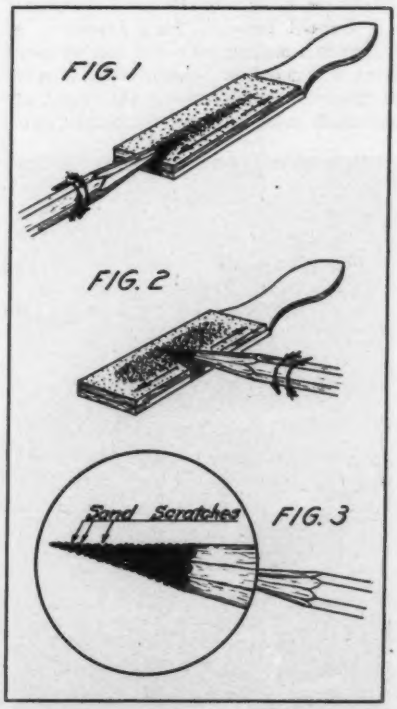
The case also may function in other ways. The machinist, the handyman around the house, the sign painter, and last and best of all, the fisherman, all will find this case ideal for their use.

It may be made of any stock ¼ or 5/16 in. thick, depending on the maker's desire. Black walnut or mahogany are beautiful woods for this case, and they will finish nicely. Other woods, such as birch or white pine, however, may be used with equal success.

PENCIL POINTS

Carl H. King, Instructor of Industrial Arts, Pontiac, Illinois

In Figure 1 is shown a method of sharpening the lead of a drawing pencil which is superior to the one ordinarily recom-



mended. The sharp point obtained with it is very serviceable for drawing purposes.

The usual method of sharpening the pencil lead is shown in Figure 2. This method is recommended by most authors of drawing texts and by drawing instructors. Objection may be raised to it, however, because of the sand scratches across the lead as shown in Figure 3. These sand scratches often cause the lead to break more easily near the point, and this is true whether used on the wedge or on the conical-shaped point.

The method of sharpening shown in Figure 1 eliminates these scratches across the lead. The longitudinal scratches formed will be found to be much less objectionable.

INEXPENSIVE CONDUIT WORK

J. McSweeney, Robert Gould Shaw School, West Roxbury, Massachusetts

The method described herewith shows how conduit work can be carried on with very little expense.

From a standard 10-ft. length of conduit, 9 pieces, each 12 in. long and one piece 10½ in. long are cut. The 12-ft. length was chosen because the boards used at the Robert Gould Shaw School are 24 by 36 in. The pieces of conduit can be used over again the following year, by having the students cut ¼ in. from each end, ream them, and thread them. These operations are course requirements. Figure 1 shows the method used with the ninth grade. The outlet boxes also may be used over and over again, by sealing the unused holes with tin disks. Figure 3 shows how a blank covering is made into a drop-cord receptacle cover. A 50715 receptacle, one ⅜-in. hard-rubber bushing, one ⅜-in. check nut, two ⅛-in. socket bushings, two ⅛-in. check nuts and two small stove bolts are used. Using the 50715 receptacle eliminates the more costly 292 receptacle that is used for conduit work only. Figure 4 shows a switch cover drilled to be used for mounting the 50715 receptacle. The wire is salvaged from the cleat knob-and-tube work. The pupils, of course, have previously been instructed in soldering and taping joints. In our conduit work, we use wire nuts for splicing. Many architects and engineers prefer this method to soldering, as it is more efficient and economical.

Figure 5 shows one set of combinations. Many others are possible.

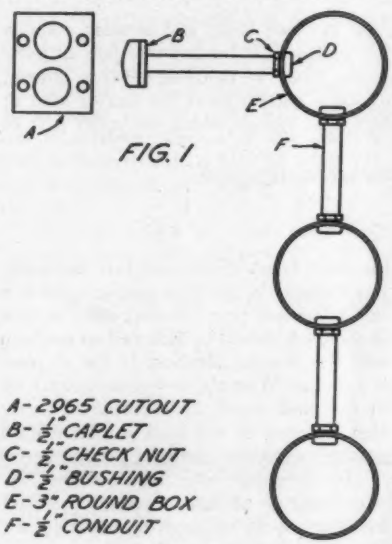


FIG. 1

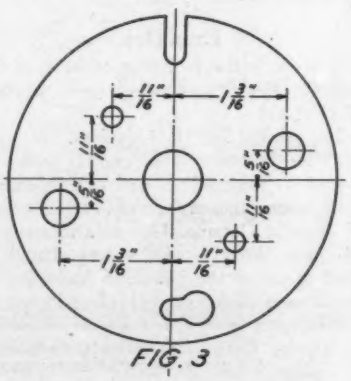


FIG. 3

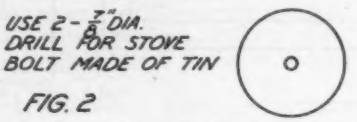


FIG. 2

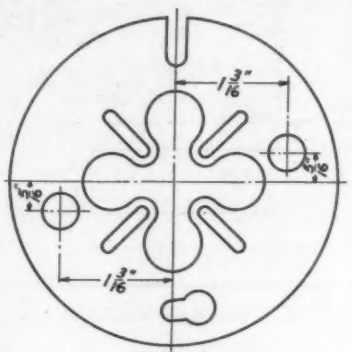
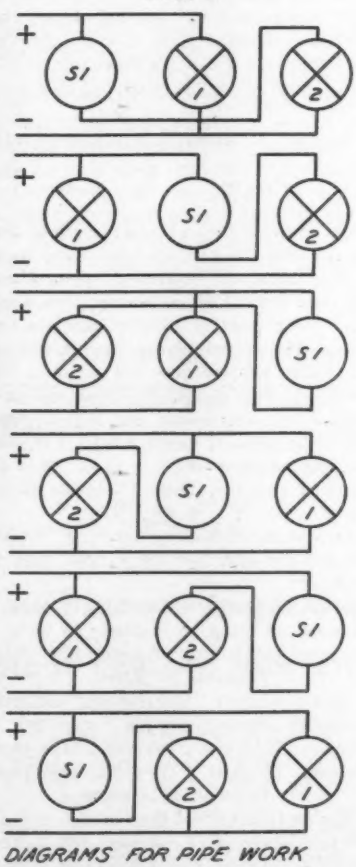


FIG. 4



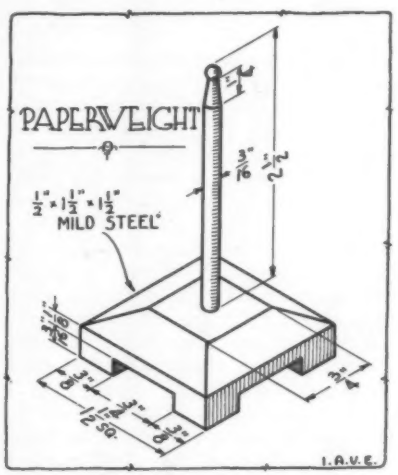
DIAGRAMS FOR PIPE WORK

FIG. 5

A PAPERWEIGHT

D. G. Miller, Ipswich, England

Made out of 1½-in. square by ½-in. thick mild steel, this paperweight affords an excellent project, either as a test in practical skill and accuracy, or for the practical application of the chisel, the hammer, and the file. First, the bevels are chipped off. Then, the waste on the underside is removed by chipping, and then all surfaces are filed dead true. A hole is then drilled and tapped through the center for the upright.



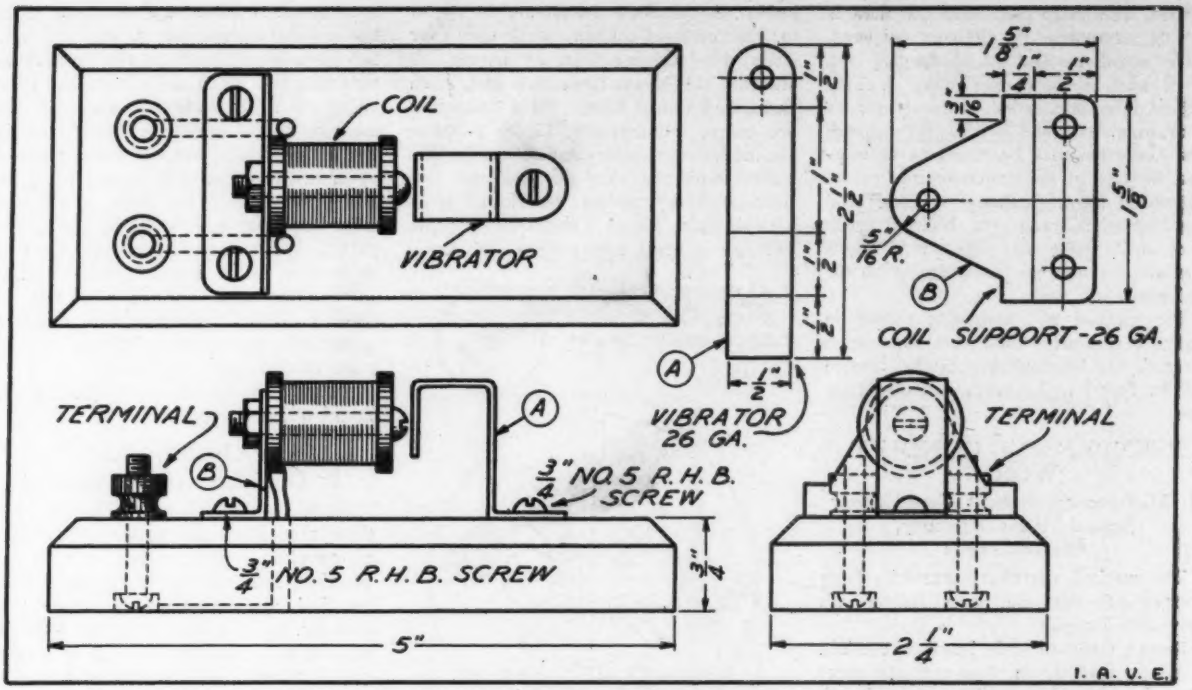
The latter is made of 3/16-in. mild steel. The ball is turned at one end and the other end is threaded. The two parts are then assembled after which the entire project is polished.

AN ALTERNATING-CURRENT BUZZER

H. R. Troyer, Bowling Green, Ohio

The buzzer illustrated herewith, is one that is suitable for seventh- or eighth-grade pupils, as its construction is very simple. Since it is made of a simple electromagnet without a breaker, it works, of course, only on alternating current reduced by a transformer.

To make the coil place the two fiber



A simple buzzer

washers and the nut on the bolt. Run the nut on far enough to get the thread end of the bolt in a hand-drill chuck. Pierce a hole in the washer at the thread end of the bolt near the center. Allow 6 in. of wire to extend through the washer, and begin winding. Fill the space between the two fiber washers with No. 24 or 26 c.c. wire, finishing at the thread end. Next, take the coil out of the chuck and remove the nut. Be careful to hold the washer in place while fastening it to the coil support. Now, run the wire down through the base and give it a few turns around the screws which are used at terminals.

This buzzer appeals to the boys and the materials making it can usually be found in the scrap box of the school or home shop.

A NEW IDEA ON INDENTION

J. Woodard Auble, Arsenal Technical Schools, Indianapolis, Indiana

Indention of paragraphs depends upon two factors, the length of the measure and the size of type. A wide measure requires more indention than a narrow measure for any one size of type. A small size of type requires more ems indention than a large size of type. The amount of indention can be determined according to the following rule: "for each normal measure or fraction of the normal measure one em indention is used." By "normal measure" is meant the length of line best suited for any one size and style of type. There are several methods of determining the normal measure, the best of which is to set up the lower-case alphabet, a, b, c, d, etc., including z and multiplying this by 1½, or in other words, one and one-half times the lower-case alphabet from a to z inclusive. For example, a line of 39 characters of 10-point Century type measures 16¾ picas and would be considered a normal length of line for this size and kind of type. Some faces of type are more "condensed" than others and their normal line is shorter than Century. Some printers roughly estimate the normal line by multiplying the type size by 2 but this method does not consider the many styles of faces. By using the first method of determining the normal line, and using 10-point Century type it is seen that any measure up to 17 picas would be indented one em, from 17 to 35 picas, 2 ems.

abcdefghijklmnopqrstuvwxyzabcdefghijklm

0 6 12 18

In Monotype Century type the "Alphabet and one half" for the various sizes of type are:

6-point, 12 picas	12-point, 19 picas
8-point, 14 picas	14-point, 24 picas
10-point, 16¾ picas	18-point, 30¾ picas
24-point, 39 picas	

Garamond type "Alphabet and one half" measures:

6-point, 10¾ picas	10-point, 14½ picas
8-point, 13 picas	12-point, 16½ picas
14-point, 18½ picas	

Caslon type normal lines are:

6-point, 10¼ picas	10-point, 16 picas
8-point, 12¾ picas	12-point, 19 picas
14-point, 29 picas	

In any one book, and in most cases in job composition for any one job, all paragraphs should be indented the same amount of space regardless of the size or kind of type. The type in which the major part of the book is set determines this indention. For example, if the main part of a book is set in 10-point type all other sizes of type in the book should be indented to conform with the 10-point idention. If the 10 point is 2 ems or 20 points, an 8-point extract set in the book would be indented 20 points also. If some of the book were set in 12 point, it would be indented 20 points.

The foregoing rules for indention not only apply to normal or regular indention but they apply to hanging indention and squared indention as well.

Examples

1. What is the indention to be used for 10-point Century type set to a measure of 21 picas?

The normal line is 16¾ picas.

21 ÷ 16¾ = 1 17/67 normal lines.

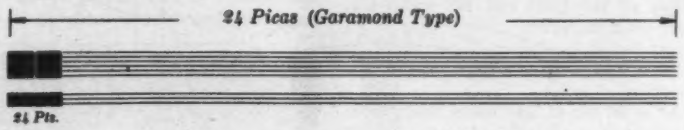
1 17/67 normal lines = 2 ems indention.

2. A quotation of 6 point is set in a page of 12-point Garamond set to a measure of 24 picas. What 6-point spaces should be used to secure the indention equivalent to the 12-point indention? (Make a layout.)

Solution:

12-point Garamond normal line is 16½ picas

24 picas ÷ 16½ = 1 5/11 normal lines
1 5/11 normal lines = 2 ems indention
2 ems 12-point type = 24 points
In 6 point to secure 24 points one uses
4 ems = 24 points.



Layout:

3. Plan the spacing for the indention of a quotation of 8 point set in a page of 10 point set to a measure of 20 picas in Century type.

Normal line for 10-point Century = 16¾ picas
20 ÷ 16¾ = 1 13/67 normal lines
1 13/67 normal lines = 2 ems indention
2 ems 10 point = 20 points
In 8 point to get 20 points one would use
2 ems = 16
1 en = 4
—
20 points.

ICE CUTTER

Dean Johnson, Gardner High School, Gardner, Massachusetts

The ice cutter described in this article can be put to good use during the winter in cutting holes in the ice for fishing, or for chipping ice from sidewalks. This cutter is made in two parts which can be readily screwed together at the coupling. This is done so that it may be easily carried or placed in an automobile.

Procedure:

1. Cut one piece of ½-in. galvanized-iron pipe 30 in. long and one piece 24 in. long.

2. Thread both ends of the 30-in. piece and screw a cap on one end and a ½-in. pipe coupling on the other.

3. Cut a thread on one end of a 24-in. piece and slit the other end 3½ in. deep and wide enough to take the thickness of the cutting iron. The cutting iron may be an old woodworking chisel, a piece of wagon-wheel tire, or a piece of automobile spring.

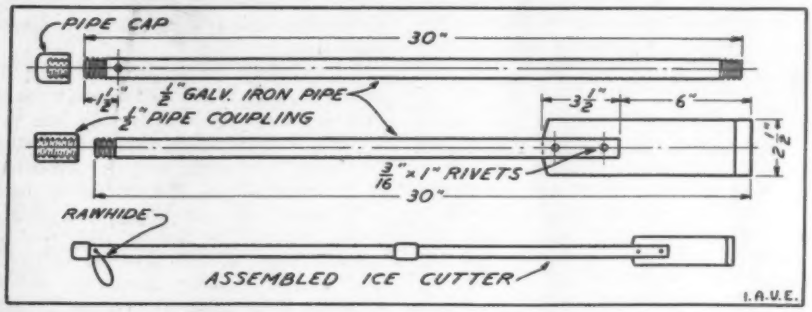
4. If necessary, anneal the cutting iron for cutting and drilling. Do this by heating it red-hot and then allow it to cool slowly in sand. Repeat this operation until the stock is soft enough.

5. Clamp the cutter in place and drill holes for the rivets through both pipe and cutter at the same time.

6. If necessary, harden the cutter by heating to a cherry red and quenching in water. Then draw the temper to a light yellow after which quench in oil or water.

7. Rivet the cutter in place.

8. Drill a hole for a rawhide thong.



MARBLEIZING FOR PRINTSHOP

Frank Di Giacomo, Stuart Junior High School, Washington, D. C.

Few processes surpass the marbleizing of stock in stimulating interest in a junior-high-school printing course. It satisfies boys' desire to create different designs in various colored inks; and it maintains the interest because of the instinctive curiosity boys possess to find out what is going to happen next. The usual project given is simple bookbinding which requires the making of a case for a book, marbleizing the cover, folding and sewing the sheets together, pasting them in the case, and then setting the name in type and printing it on the cover. This project has become one of the most popular at Stuart Junior High School. The sheets used for the inside pages are usually scraps obtained from production jobs printed for the school. The cover stock and board in most cases must be cut to the size desired from large sheets in stock, but sometimes scrap is obtainable for these also.

In large binderies, marbleized effects on book edges are obtained by the use of a specially prepared gummy liquid on which

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TACT

Tact is that which enables one to get the desired response from another without causing him any irritation. Tact is possessed in large measure by leaders of men.

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Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York

water colors are dropped. By passing a comblike stick through this liquid very beautiful designs are then obtained. However, in most junior high schools, special material is not obtainable; and if marbleizing is desired, it must be done with the materials at hand in the shop. All shops in junior high schools have various colored inks, water, kerosene, and in most cases a few cookie pans, and one larger pan about 9 by 12 in., can be obtained from one of the other school departments without entailing additional expense. Very fine results have been obtained with this very meager equipment by following the method described in the lesson which follows.

Objective: How to marbleize stock.

Equipment: Inks, cookie pans, large pan, water, paper stock, kerosene.

Information: The marbleizing process results in a variety of colors similar to those seen on wallpaper or inside the covers of some books. The colors completely cover the sheet, offering a simple but effective way of improving the appearance of the stock. Marbleized stock has a tendency to curl; it is necessary to place weights over the stock for a while. If printed matter is to be run over marbleized stock, it is advisable to use light colors, otherwise the print will be hard to read.

Operations:

1. Secure from the instructor the stock, the necessary inks, cups, and pans.
2. Pour kerosene in each cup to a depth of ½ in.
3. Add to each cup a small amount of the different colored inks; stir with a small paddle until all the ink is dissolved.
4. Fill the large pan with water to about one-quarter capacity.
5. With the sticks spatter a few drops of each color on the surface of the water. Stir the mixture until the colors blend into some suitable design. Do not dip the stick too deep into the water because the ink must remain on top. Stir colors slightly after each print.
6. Gently drop the sheet of stock on the surface of the solution. Pick the sheet out immediately by lifting one corner. Do not allow the sheet to be submerged.
7. Print a few sheets and change the water because the colors will run together.
8. Spread the sheets out to dry and then place a weight over them.
9. Clean off the table and put away the pans and other materials.

Questions:

1. Outline briefly the procedure in marbleizing stock.
2. Why is the use of light colors better than dark color when the marbleized stock is going to be printed over?

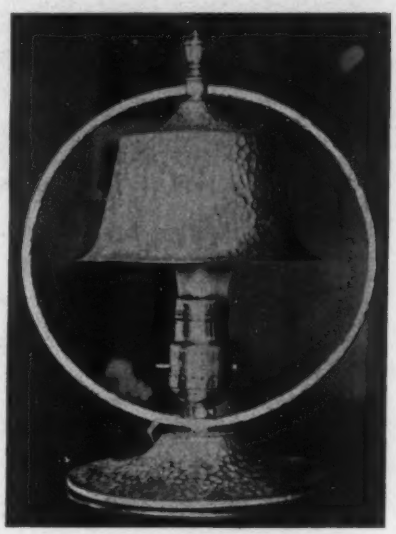
BEDSIDE LAMP

Karl J. Miller, Farmington, Minnesota

The brass bedside lamp illustrated and described in this article was designed to be used as an art-metal project for junior- and senior-high-school students. Some very presentable lamps were made by ninth-grade boys.

To speed up production and also to insure uniformity, it is well to make forms in which the metal for the base and the upper half of the shade may be hammered to form. These forms may be turned out of hardwood blocks. The one for the base will require a block about 7-in. square and 4 in. long. Use the end grain for the recess. Fasten the block to the faceplate and turn a cylinder about 6⅛ in. in diameter. Counterbore the end to a depth of 1/16 in. to fit a 6½-in. disk. Then bore out the block to conform to the base profile as shown. The form for the upper half of the shade is made in the same manner except that a block 4 in. square is used because the disk for this part of the shade is only 3½ in. in diameter.

To make the base, cut a disk 6½ in. in diameter from 20-gauge brass. If the brass is not annealed, heat the metal red-hot and quench in water. Then place the disk in the form and with a ball-peen hammer start hammering near the outside, working toward the center. Be sure to keep the hammer marks close together. It will be necessary to reanneal the metal several times before the job is completed. If the metal is allowed to become too hard from hammering, it may crack. When the base has been shaped, it is ready to be peened.



Bedside lamp

This may be done with either a ball- or a cross-peen hammer. If the cross-peen is used, care must be taken to see that all marks radiate from the center. After the peening has been completed, it will be necessary to reshape the base. A No. 12 wire should be inserted in the edge to strengthen it. A pair of pliers and a mallet or a turning machine may be used for this wiring operation. Solder a 1¾-in. disk of No. 24-gauge galvanized iron to the lower side of the top of the base. This will stiffen the base at this point. Drill a ⅜-in. hole in the center and another for

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VIGOR

Vigor is the power which drives one to do his work quickly and well. The accomplished job brings happiness and satisfaction to such an individual.

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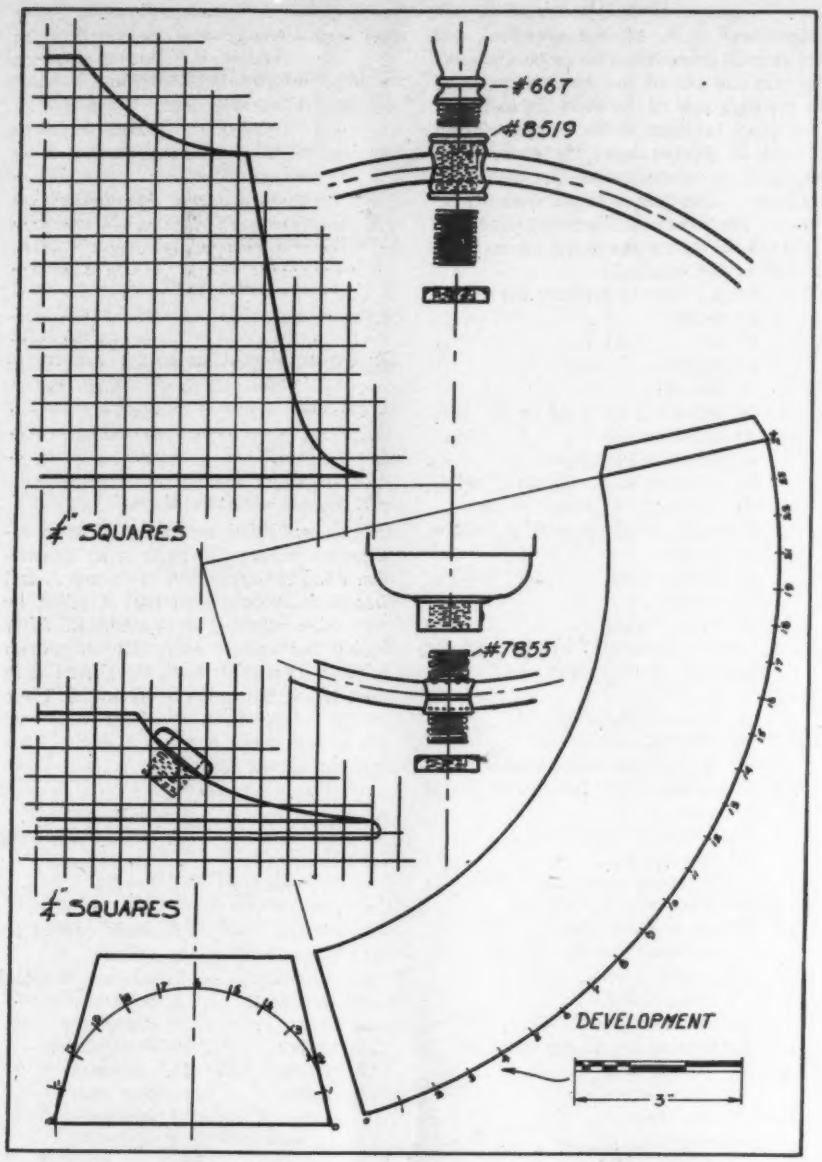
Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York



Bedside-lamp details

the light-cord bushing ¾ in. from the top of the base as shown in Figure 2.

Cut a disk 3½ in. in diameter from the same metal used for the base. This must be hammered into the form prepared for the upper half of the shade. A smaller ball-peen hammer will be necessary for this. After the forming is finished, peen the same as the base.

The metal used for the lower half of the shade should be about a 24-gauge and should be cut according to the stretch-out shown in Figure 2. The lap joint is held together with three ½-lb. brass rivets, spaced evenly.

Be sure the metal is soft before the flaring operation is started. This is done over a conductor stake, taking care to hold the shade in such a manner as to be able to strike with a mallet on the inside of the shade. Start the hammering at the very bottom edge, gradually working toward the top. Don't try to work too fast. It is well to hammer around once in one direction, and then reverse the operation. Keep the metal soft by annealing. When the shade conforms to the desired shape, it is ready to be peened, after which some reshaping will be necessary.

Fit the two pieces of the shade together by filing the upper half until it fits snugly on the inside and at the very top of the lower half. A tight fit here is very essential, for too much solder will flow through if the joint is poorly made. Solder the two pieces together on the inside. Drill a ⅜-in. hole in the top.

The ring requires a piece of ¼-in. brass rod, 24 in. long. Peen this before forming.

All pieces are now ready to be cleaned. This may be accomplished either by immersing them in hydrochloric acid or by rubbing them with steel wool. (Be careful not to get any of the acid on your clothes or hands. Wash all parts thoroughly.)

Drill a hole in the sides of fitting No. 8519 and file until it slides freely on the ring. Drill a ¼-in. hole in the other side of fitting No. 7855. Place No. 8519 on the ring, and solder No. 7855 at the ring joint making sure that the ring is separated enough to allow the light cord to pass through the fitting. Fasten the ring to the base with a lock nut so that the bushing hole in the base will be at the back of the lamp. Fasten the shade to No. 8519 fitting with the short nipple and lock nut as shown. Screw fitting No. 667 into No. 8519. This acts as a finial and also locks the shade in any desired position on the ring. Screw the fiber bushing in the hole in the base, and the lamp is ready to be wired. Either a turn-button, or a cross-bolt light socket will work best.

To keep the lamp from tarnishing, apply either wax or clear lacquer.

All fittings used in this lamp may be purchased from the Faries Mfg. Co., Decatur, Ill. The cost of the fittings amounts to about 13 cents. All numbers used in the explanation are the same as those used in the Faries catalog.

AN AUTO-MECHANICS-SHOP TEST

George G. Mann, Holden Central School, Cold Spring, New York

Part I

Directions: Any statement below that is false or partially false, mark with an F in the space provided before the statement. Any statement that is true, mark with a T in the space provided.

Example: The following statement is true, therefore, it is marked with a T.

(T) The engine is usually located in the front of the chassis.

( ) 1. 600 W grease should be used in the transmission in the winter.

( ) 2. Garage doors should be opened while the engine is running.

( ) 3. Three-point suspension of the power plant refers to the number of points to which the engine is attached to the frame.

( ) 4. The initial source of electric current used by the automobile is the generator.

( ) 5. The driveshaft transmits the power from the engine to the transmission.

( ) 6. The function of the carburetor is to mix gasoline with air.

( ) 7. It is practical to operate an engine in an automobile without a flywheel.

( ) 8. Piston rings are used only to carry oil on the cylinder walls.

( ) 9. The Diesel engine has no spark plugs.
( ) 10. There are three main sizes of spark plugs.
( ) 11. Air cleaners are attached to the carburetor.
( ) 12. Tires should always be inflated a few pounds less than the manufacturer recommends so that they will ride easier.
( ) 13. All dippers on connecting rods are usually of the same form and design.
( ) 14. It is not desirable to have the auxiliary air valve adjustable.
( ) 15. The battery should be filled to top of the case with water.

Part II

Directions: Each of the following questions can and should be answered by a single word or number. Write the correct answer in the blank space provided for it. Be sure that you write only one word or number after each.

1. Name the four strokes of a four-stroke cycle motor and the length of each in degrees of travel by the crankshaft.
   First .... deg.
   Second .... deg.
   Third .... deg.
   Fourth .... deg.
2. What is the ratio between camshaft and crankshaft travel?
   ..... to ..... ratio.
3. In a 6-cylinder motor with No. 5 cylinder 15 deg. past top dead center on the power stroke, on what stroke is No. 2 cylinder?
   ..... stroke.
4. With the exhaust valve on No. 4 cylinder just closed (6-cylinder motor, firing 153624), what cylinder is just on the firing point?
   ..... cylinder.
5. How many degrees apart are the power impulses on a 4, 6, 8, 12, 16 cylinder engine,
   4-cylinder motor ..... deg.
   6-cylinder motor ..... deg.
   8-cylinder motor ..... deg.
   12-cylinder motor ..... deg.
   16-cylinder motor ..... deg.
6. The two conventional types of firing orders for 6-cylinder engines are:
   a) .....
   b) .....
7. The speed ratio between the crankshaft and the distributor shaft is
   ..... to .....
8. The rear-axle gear ratio when the car is in high is approximately
   ..... to .....
9. What two types of valve and cylinder-head arrangements are the most common?
   a) ..... type.
   b) ..... type.
10. The scientific principle used in clutches is .....

Part III

Directions: Each of the questions and statements given below is to be answered by selecting one of the answers suggested at the right side of the sheet. In each case the letter in front of the correct answer should be written upon the short blank line in front of the question or statement.
Example: The answer to the question below is the word *oil*. Therefore since the letter *b* is before the word oil it is inserted in the blank,

b What is used to lubricate the engine?
   a) water
   b) oil
   c) graphite
   d) lard oil

.. 1. Oil cartridges are used to
   a) clean the oil
   b) lubricate the engine
   c) as a substitute for liquid oil
   d) lubricate the transmission

.. 2. Engine bearings are usually made of
   a) bronze
   b) copper alloy
   c) babbitt
   d) monel metal

.. 3. Link belt drive is largely used for camshaft drive because it
   a) is cheap
   b) is easily installed
   c) does not stretch
   d) is free from objectionable noises

.. 4. Connecting rods are forged in the form of a
   a) flat beam
   b) round beam
   c) hexagonal beam
   d) I beam

.. 5. Knight engines have
   a) overhead valves
   b) poppet valves
   c) sleeve valves
   d) valves in head

.. 6. Crankcases are usually made of
   a) copper alloy
   b) aluminum
   c) cast iron
   d) steel
   e) wrought iron

.. 7. Best practice specifies a main bearing for the crankshaft on
   a) each side of the cylinder
   b) only at the ends of the crankshaft
   c) only at the ends and in the center of the crankshaft

.. 8. Pumps used for water circulation on automobiles are usually of the
   a) force type
   b) rotating vane type
   c) piston type
   d) centrifugal type

Part IV

Directions: List the operations in the correct order for each job listed below; listing below the title of each job on the lines provided.

A. Cleaning and adjusting spark plugs.
   1..... .....
   ....
   ....
   ....
   ....
   ....
B. Installing new head gasket.
   1..... .....
   ....
   ....
   ....
   ....
   ....
C. Replacing Bendix.
   1..... .....
   ....
   ....
   ....
D. Replacing dust or grease washers in front wheel.
   1..... .....
   ....
   ....

Part V

Directions: Below are two columns of expressions or names of parts of an automobile. Read the expression in column A and then find an expression that it might be used with correctly in column B. After finding the correct expression in column B, place its number upon the short line in front of the expression in column A. There are more expressions in column B so that you cannot guess. Number A in list I has been completed for you.

List 1

A	B
4 *a*) piston	1. throw out bearing
.. *b*) tire	2. transmission
.. *c*) thermostat	3. Bendix
.. *d*) starter	4. ring
.. *e*) clutch	5. water control
.. *f*) syncro-mesh	6. balloon
.. *g*) full floating	7. exhaust manifold
.. *h*) downdraft	8. poppet
.. *i*) points	9. distributor
.. *j*) muffler	10. front wheels
.. *k*) valves	11. carburetor
.. *l*) camber	12. rear end
	13. spring
	14. tank

List 2

A	B
.. *a*) rotor	1. Pierce Arrow
.. *b*) lovejoy	2. Chevrolet
.. *c*) facing	3. two camshafts
.. *d*) starting motor	4. propeller shaft
.. *e*) torque tube	5. flywheel
.. *f*) housing	6. shock absorbers
.. *g*) third brush	7. clutch
.. *h*) spider gear	8. rear axle
.. *i*) T-head engine	9. distributor cap
.. *j*) L-head engine	10. intake valves overhead and exhaust valves in block
.. *k*) I-type engine	11. rear drive gears
.. *l*) F-head engine	12. generator
	13. Water pump
	14. roller bearings

Part VI

Directions: Below is a list of problems.

Do them on this sheet.

1. An 8-cylinder engine has a 2¼-in. bore. What is its S.A.E. rating?
2. How much braking surface has a car with a 2-in. brake shoe and a drum 6 in. in diameter?
3. A man travels 428 miles in one day. He used 35 gallons of gasoline at 17½c a gallon and 3 quarts of oil at 35c a quart. He gets $20 for making the trip. How much did he make?

Part VII

Directions: Do the following drawings, labeling the parts.

1. Draw a diagram of a simple high-tension ignition system.
2. Draw a diagram of front wheels of an automobile showing camber and toe-in.
3. Draw a diagram of the frame of a car and correctly locate: power plant; brakes; rear end housing; springs; propeller shaft; transmission; gas tank.

Part VIII

Directions: Turn your papers in and secure the tools necessary to grind one valve in on the Ford V 8 job in the shop. Call the instructor when you have finished.

Answers

Part I

1. F	6. T	11. T
2. T	7. F	12. F
3. T	8. F	13. F
4. F	9. T	14. F
5. F	10. T	15. F

Part II

1. Intake. 225 deg.; Compression. 135 deg; Power. 130 deg.; Exhaust. 230 deg.
2. 1 to 2
3. Intake
4. 3
5. 180, 120, 90, 60, 36
6. *a*, 1, 5, 3, 6, 2, 4, and *b*, 1, 4, 2, 6, 3, 5
7. 2 to 1
8. 3½ to 1
9. *a*, overhead; *b*, valve-in-head
10. Friction

Part III

1. *a*	4. *d*	7. *a*
2. *c*	5. *c*	8. *b*
3. *d*	6. *b*	

Part IV

A. 1. Remove plugs from head
2. Removing carbon from plugs
3. Brightening plug points
4. Inspecting porcelain
5. Adjusting gap
6. Replacing plugs

B. 1. Disconnecting distributor
2. Draining water
3. Removing spark plug
4. Disconnecting top radiator hose
5. Removing stud bolts
6. Removing head
7. Removing gasket
8. Cleaning carbon
9. Putting on new gasket
10. Replacing head

C. 1. Removing starting motor.
2. Disassembling
3. Taking out broken Bendix
4. Replacing
5. Assembling
6. Putting motor in place

D. 1. Removing front wheel
2. Prying out container
3. Inserting new washer
4. Greasing and assembling

Part V

List 1

a) 4	*e*) 1	*i*) 9
b) 6	*f*) 2	*j*) 7
c) 5	*g*) 12	*k*) 8
d) 3	*h*) 11	*l*) 10

List 2

a) 9	*e*) 4	*i*) 3
b) 6	*f*) 8	*j*) 1
c) 7	*g*) 12	*k*) 2
d) 5	*h*) 11	*l*) 10

Part VI

1. $$\text{h.p.} = \frac{d^2 \times n}{2.5}$$

$$= \frac{(2.25)^2 \times 8}{2.5}$$

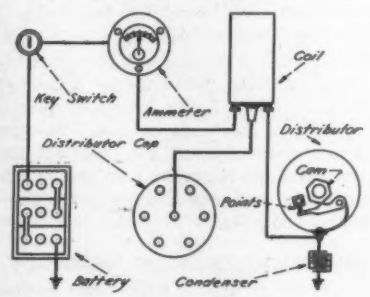
$$= \frac{5.06 \times 8}{2.5} = \frac{4048}{2.5}$$

$$= 16.2 \text{ Ans.}$$

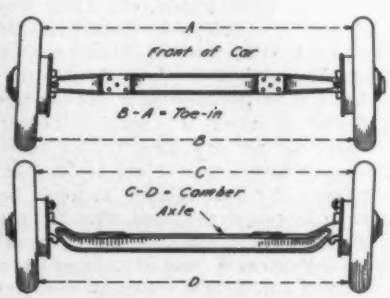
2. $\pi d \times 2 \times 4$
$= 6 \times 3.1416 \times 2 \times 4 = 150.8$ sq. in.
3. $20.00 - (35 \times .175 + 3 \times .35)$
$= 20.00 - (6.125 + 1.05)$
$= 20.00 - 7.18 = \$12.82$ profit

Part VII

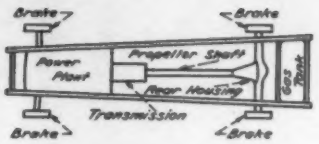
1. High-tension ignition system.



2. Camber and toe-in.



3. Frame diagram.



Make sure these items are on:

a) Power plant
b) Brakes
c) Rear end housing
d) Propeller shaft
e) Transmission
f) Gas tank

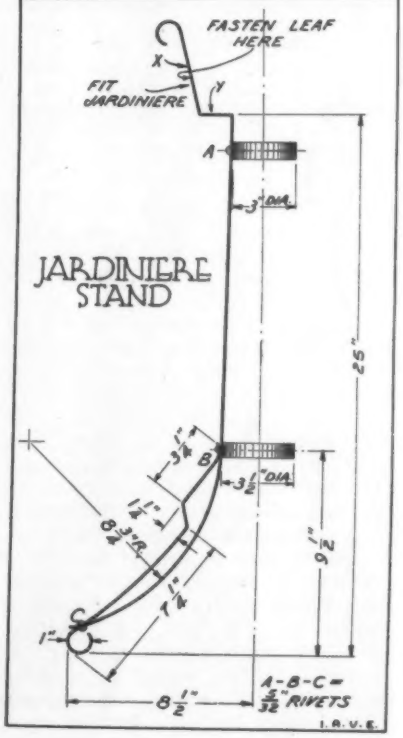
JARDINIERE STAND

Oran H. Beaty, Junior-Senior High School, Newton, Iowa

The jardiniere stand illustrated and described in this article is not difficult to make. The halftone shows one made by a boy in the eighth-grade metal shop.

The stand is made of hammered mild steel. The rings may be either riveted or welded; the dimensions given are for riveted joints. In some cases, we have constructed the stands using material of 3/16-in. thickness, thus doing away with the braces.

PCS. REQ.	NAME	SIZE
3	LEGS	$\frac{1}{8}$" × $\frac{3}{4}$" × 29$\frac{1}{2}$" PLUS X AND Y
3	BRACES	$\frac{1}{8}$" × $\frac{3}{8}$" × 12$\frac{1}{4}$"
1	RING	$\frac{3}{16}$" × $\frac{3}{4}$" × 10"
1	RING	$\frac{3}{16}$" × $\frac{3}{4}$" × 11$\frac{1}{2}$"
3	LEAVES	1$\frac{3}{8}$" × 3$\frac{1}{2}$" × 20 GA.



Jardiniere stand

The small leaf-shaped decorations at the top, shown in the halftone, are hammered and made somewhat convex. They may be either riveted or welded to the stand.

Answers to Questions

PLATING GRAY-IRON BOOK ENDS

1002. Q.: We are getting out 500 book ends in gray iron. Can you give us a method for dipping same for a bronze finish? Will appreciate other commercial finishes for gray iron. — *E. E. P.*

A.: Since there are many formulas for bronze finish on gray iron, such as chemical or paint finishes, spray or brush finishes, I must make a shot in the dark. Here goes!

First, clean the gray-iron casting in the tumbler or by sandblasting. Second, clean in a 10 per cent hot sulphuric-acid solution and then in clean hot water. In diluting the acid, first measure out the correct amount of concentrate for the work in hand, run into glass or earthenware, and then *add to* the water by letting the acid run slowly down a stick. In this manner the violent eruption of acid and water will be avoided. *Never pour water into the acid!* For convenience in handling, wire all pieces with a copper wire, or dip in strap copper baskets. After cleaning, dry hot, and do not touch the cleaned metal with the hands or spotting will develop.

Next, hang the gray iron on a brass rod suspended over a tank of a strong solution of copper sulphate. See that the iron is totally submerged. Connect the brass bar to the negative pole of a 6-volt battery. The positive pole of the battery should be connected to a sheet of copper suspended in the same solution, but not touching either the castings or the rod on which they are hung. Plate for about 5 minutes, take out, wash thoroughly in hot water, then dry.

Scratch-brush with tampico or fine wire brushes at 3500 r.p.m. and then dip into a solution of 3 oz. pot. polysulphide to 1 oz. concentrated ammonia. Remove from toning solution, rinse and dry. High-light with rag or tampico wheel as desired. Wax and brush bright. — *Ralph G. Waring.*

A CHEAP FINISH FOR KINDERGARTEN BLOCKS AND BEADS

1007. Q.: Many of the cheaper blocks and kindergarten beads on the market seem to have a water-stain finish which is quite durable and good-looking. Can you tell me how to apply it? — *B. G. D.*

A.: The beads to which you refer are placed in baskets and dipped into a hot water-stain solution. They are then dried, put into a tumbling barrel and tumbled for a few minutes to burnish them. Then a small amount of tumbling lacquer is added. The barrel is closed and the beads are again tumbled for half an hour. They are then screened, and the tumbling lacquer is taken out of the barrel. The beads are again tumbled into the finish until the finish is dry and has a good polish.

I know of no hand method which will give the same results other than stringing the beads on copper wire; dipping them into hot stain; drying, burnishing with a hard, close-woven cloth by rubbing lengthwise of the string of beads while the wire is taut; then dipping the beads into a semigloss lacquer, after which they must be withdrawn slowly so that all the excess lacquer is pulled off as the beads emerge. The wires are then suspended until the beads are dry, after which the beads are polished by rubbing while the wire is stretched taut. — *Ralph G. Waring.*

FINISHING GREEN HICKORY

1018. Q.: I wish to finish some sections of green hickory to be used for inkwell holders, toothpick holders, etc. These sections will be about ½ in. thick with the bark left on. Can these be finished so that they will not check? — *J. W. H.*

A.: Cut the hickory "now that the sap is down," as timber men express it, so that the bark will not peel. Keep the log material under cover where it will not dry out too fast and cause checking, as would be sure to happen if the wood were brought into the shop. When you have some of these novelties to turn out, bring in a section of suitable wood; turn up what you need and finish immediately with filler, whether colored or natural, which has an appreciable amount of varnish as the binder in the vehicle. Let dry overnight in a warm but not hot room, and after 24 hours, give a coat of 4-hour varnish and let dry overnight. Revarnish after 24 hours' drying, sanding with 6/0 paper between coats. Let the last coat dry three days and oil-rub for finish, with felt pad, crude oil and FFF pumice stone, or give a coat of flat varnish over the first gloss coat and do not rub. — *Ralph G. Waring.*

Renew your membership in the American Red Cross

Personal News

DEATH CALLS FORMER EDITOR OF INDUSTRIAL ARTS MAGAZINE

Mr. Samuel J. Vaughn, former president of the Colorado Women's College at Denver, and of Hardin College for Women at Mexico, Mo., died at his home in Windsor, on August 26, at the age of 62 years.

Mr. Vaughn, who was born at Elkton, Mo., February 12, 1877, was graduated from Weaubleau (Mo.) Christian College in 1897. He received his A.B. degree from Drury College (Mo.) in 1908, and was on the summer staff of the University of Chicago from 1905 to 1910.

Following his graduation, Mr. Vaughn was principal of the Dadeville, Mo., Academy from 1899 to 1902. From 1902 to 1905 he was superintendent of schools in Missouri, and from 1905 to 1908 was director of industrial education in Springfield, Mo. In 1908 he went to the Northern Illinois Teachers' College, at DeKalb, as director of teacher training, where he remained until 1920. From 1920 to 1921 he was head of the department of industrial education of the University of Illinois. He resigned in 1921 to become president of Hardin College, in Mexico. In 1926 he resigned to be-

come president of the Colorado Woman's College in Denver, resigning in 1932.

Mr. Vaughn was one of the editors of the INDUSTRIAL ARTS MAGAZINE from 1914 to 1918. He was the author of a number of books on industrial-arts subjects, and was a lecturer

S. J. VAUGHN

on educational, social, and economic problems. He was president of the Western Arts Association in 1915 and of the Vocational Educational Association of the Middle West in 1916.

MR. FRANK M. LEAVITT RETIRES

Mr. Frank M. Leavitt, formerly associate superintendent of schools in charge of vocational education at Pittsburgh, Pa., has retired.

Mr. Leavitt, a native of Boston, Mass., was educated in the public schools of Boston. He is a graduate of the Massachusetts Institute of Technology, and also attended Harvard University, the University of Wisconsin, the University of Chicago and the Sloyd Seminarium in Sweden.

FRANK M. LEAVITT

Prior to going to Pittsburgh, he was director of manual training in the Boston public schools, and associate professor of industrial education at the University of Chicago.

Mr. Leavitt is a past-president of the Eastern Arts Association, the Boston Manual Training Club, and the Vocational Department of the National Education Association.

His interest in industrial arts and vocational education has always been very keen, and his contributions to these fields have been many.

RECEIVES APPOINTMENT AS SUPERVISOR OF MECHANIC ARTS

Mr. Harvey H. Wheaton, formerly instructor in mechanical drawing and cabinetwork at Everett, Mass., has become Supervisor of Mechanic Arts in the high school at Concord, N. H.

Mr. Wheaton, a graduate of the Springfield High School and the Sloyd Training School of Boston, obtained his B.S. degree from Boston University in June, 1928, and his master's degree from the same institution in 1935.

HARVEY H. WHEATON

Mr. Wheaton has had sixteen years of experience in mechanic-arts work. From 1919 to 1923 he was an instructor in Milford and New Haven, Conn., and in West Springfield and Gardner, Mass. In 1923 he went to Springfield as supervisor of manual arts, where he was in charge of the organization of the high-school shops. In 1926 he went to Boston University and during this time he was an instructor in the Huntington School for Boys and assisted in junior achievement activities. From 1928 to 1932 he was boys' work secretary at the Cambridge Y.M.C.A., and director of programs at the Y.M.C.A. camp in Dunstable, Mass. During the period from 1932 to 1936, Mr. Wheaton was an instructor in mechanical drawing and cabinetwork in the senior high school in Everett.

In addition to his teaching experience, Mr. Wheaton has had extensive opportunities to study how to deal with boys through his work as director of boys' clubwork, his work as a camp counselor, and camp program director. He is the author of numerous articles on industrial-arts subjects published in educational periodical literature.

BECOMES ASSISTANT DIRECTOR OF INDUSTRIAL ARTS

Mr. Lush, who was recently appointed assistant director of industrial arts of Minneapolis, Minn., is a graduate of the Mankato Teachers' College, and obtained his master's degree from the University of Minnesota.

Following his graduation, Mr. Lush taught industrial arts at Fertile, Wells, and Mankato, Minn., for several years, and for the past few years had taught in the junior high schools of Minneapolis. His most recent position was in the Sheridan Junior High School, where he was a counselor in addition to his industrial-arts teaching.

The appointment of Mr. Lush to the central office staff in Minneapolis is a move toward

C. K. LUSH

more adequate professional supervision of the industrial-arts work in the public schools of Minneapolis.

¶ MR. GRANT W. BLISS, an instructor in the vocational high school at Syracuse, N. Y., died in a local hospital on August 24, after an illness of several months. Mr. Bliss had been an instructor in the schools for 26 years and had previously served on the faculty of the old Technical High School before teaching in the vocational high schools. He had attended Marathon Academy and was graduated from the Genesee Wesleyan Seminary and Cornell University at Ithaca.

¶ MR. ANDREW ALTHOUSE, formerly an instructor in auto mechanics in the public schools of Detroit, Mich., has been appointed to a full-time supervisory position. He will have his headquarters in the administration building opposite Wayne University.

¶ MR. CLYDE SKINNER, has assumed his duties as an instructor in industrial arts in the Denby High School, Detroit, Mich.

¶ MR. GERALD BAYSINGER has been appointed as an instructor in the McKenzie High School, Detroit, Mich., where he will assist in the expanded program now being carried out. He was formerly an instructor in the general shop of the Foch Intermediate School.

¶ MR. ELMER STINDT, formerly an instructor in the printing department of the Cass Technical High School, Detroit, Mich., has become a member of the faculty of the Nolan Intermediate School.

¶ MR. CARL FALIK has become a member of the vocational department at the Northeastern High School, Detroit, Mich. He will teach drawing.

¶ MR. B. E. OTT has become head of the auto-mechanics department at the Cass Technical High School, Detroit, Mich. He succeeds Mr. Andrew Althouse in this position.

¶ MR. THOMAS ATKINS has been appointed instructor in the general shop of the Foch Intermediate High School, Detroit, Mich., where he succeeds Gerald Baysinger.

¶ MR. EARL BEDELL, assistant director of vocational education in the public schools of Detroit, Mich., was a member of the summer-

school faculty at the Pennsylvania State College during the past summer. He taught problems in industrial education in connection with a graduate-school course, supervised by Dr. F. T. Struck, head of the department of industrial education of the College.

¶ Mr. John Gale Hun has been appointed as president of the Jourden Diesel Schools, Inc., at Pittsburgh, Pa. The branch school in Pittsburgh is devoted exclusively to instruction in Diesel engines. It has added considerable new equipment in order to provide students with the best theoretical and practical training in Diesel engine work.

¶ Mr. David Miller has been appointed as instructor of printing at the Cass Technical High School, Detroit, Mich. He succeeds Mr. Elmer Stindt in this opsition.

Association News

THE A. V. A. TO MEET IN SAN ANTONIO, TEXAS

The American Vocational Association will hold its annual convention December 2 to 5, in San Antonio, Tex. The selection of San Antonio as the convention city is of particular interest at this time. There has been a marked increase of interest in vocational education in the states of the south and midwest. The Lone Star state is alive to the possibilities of the practical arts and vocational education for her youth.

The city has excellent facilities for housing the convention. The registration headquarters and the exhibits will be located in the Gunter Hotel. There also will be space for the trade and industrial, commercial, guidance, and rehabilitation groups. The industrial-arts section will be housed in the Plaza Hotel, while the home-economics section will have its headquarters in the St. Anthony Hotel.

The city offers a number of attractions to the visiting teachers. Pioneers from Spain, France, Mexico, England, and the Confederacy have built monuments that make San Antonio one of the most picturesque cities of the nation. Here the visitor will see the modern Alamo Plaza, the Mission Drive to the Mission San Jose, the famous Rose Window with its fine Moorish carvings, the Mission San Francisco de Espada, San Juan Capistrano, and Concepcion de Acuna, and the San Fernando Cathedral. Less than three blocks from the cathedral is the Spanish Governor's Palace, where representatives of the kings of Spain lived and ruled for a hundred years.

To the south of San Antonio lies Old Mexico, and the Pan-American Highway from San Antonio to Mexico City has been paved and is completed ready for use. Monterey, the industrial and trade center of Northern Mexico, is only six hours from San Antonio, on the Pan-American Highway.

The convention program will be devoted to a review of the situation in which American youth finds itself under present conditions relative to employment possibilities and unemployment difficulties. Leaders of various national agencies dealing with the youth problem have co-operated in the preparation of a program looking toward the development of facilities which are significant in connection with the occupational adjustment of youth and the vocational adjustment of adults.

In view of the shortage of skilled workers in certain trades and because of the growing recognition of the need for occupational training on the part of youth, the program will be of more than usual interest. Reports will be presented on objectives and procedures in the training of employed and unemployed youth and adults. Among the topics to be presented are the following: Vocational Training the Employer and the Public School Ought to Provide; New Developments in the Psychotechnique of Selecting and Training; New Developments in Industrial Education; Training for Operation of the Diesel Engine; Methods in Home Construction and Their Significance to Industrial Education; Apprenticeship and Industrial Training for Youth; The Industries and the Public Schools in the Building of the Next Generation; The Apprenticeship Need in the Building Trades; How Organized Labor Functions in Vocational Training.

The session devoted to industrial arts will take up a review of the work of the section, with a discussion of problems now confronting the industrial arts as a part of the public-school program and the formulation of a program for future work.

The second meeting will deal with "The Boy" in the junior high school, with the emphasis on what may be done to improve the boy through industrial-arts experiences.

The third meeting will devote its attention to the place and purpose of the industrial-arts work in the senior high school. This will be discussed by a principal, a teacher, and a supervisor.

There will be a session devoted to vocational guidance. Dr. Edwin A. Lee, of the National Occupational Conference, and Dr. Charles A. Prosser, of Dunwoody Institute, will address the session.

There will be an interesting panel discussion on the topic, "What Place Have Vocational Teachers and Teacher Trainers in a Program of Vocational Guidance?" Another panel will be devoted to the topic, "How Should the Schools and Employment Service Officers Co-operate in Placing Youths as They Leave School?" Dr. Prosser will give a talk on the subject, "What Should the Schools Do in Helping Youth to Get Jobs?"

Provision has been made for a large commercial exhibit and a large portion of the space has already been assigned for the exhibit of apparatus and supplies for practical arts and vocational education.

In addition to the outside attractions, the visiting teachers will be taken on trips to the vocational and high schools of the city. They will visit the San Antonio Vocational and Technical School, which is one of the outstanding schools of the kind in the Southwest, the Lanier Vocational School, and other schools of a similar nature.

FUTURE CRAFTSMEN OF AMERICA TO HOLD NATIONAL MEETING IN DETROIT

The Future Craftsmen of America will hold their first national meeting November 6 and 7, in Detroit, Mich. This association is an organization of youth operating in the public-school systems of the country for the promotion of the spirit of craftsmanship. It is similar to the Future Farmers of America, an organization for agricultural students.

The Future Craftsmen of America, through their activities, seek to promote the spirit of craftsmanship by giving recognition for school accomplishment. It operates through the local public schools as part of the school-club program and seeks to give recognition for work performed under regular public-school programs. Local chapters of the organization are affiliated with the state chapters, and the several state organizations affiliate with the national chapter.

The main purposes of the organization are: (1) to promote the spirit of craftsmanship; (2) to provide opportunity for experience in leadership; (3) to encourage interest in hobbies and leisure-time activities involving craftsmanship; (4) to aid the student in the intelligent choice of an occupation; (5) to increase the knowledge of industrial organization, the interdependence of workers, trade ethics, and safety; (6) to promote thrift through the intelligent use of the products of industry and the wise use of educational and training facilities; (7) to motivate a studious attitude among youth interested in craftsmanship; (8) to assist the student in the transition from school to work; and (9) to promote fellowship among youth interested in industrial education.

The Future Craftsmen of America is a boys' organization with a limited adult sponsorship, selected from teachers and officials interested in craftsmanship. It seeks to serve industrial youth in a way similar to that which the Future Farmers serves agricultural youth.

The organization has perfected a system of awards to be given for achievement in craftsmanship. These awards are based on personal qualities, character, attainment in leadership, practice of safety, skill in the crafts, including technical knowledge. It gives practice in civic participation by providing a program which is local, state, and national in scope. It challenges youth to exert his influence for high social purposes. The second basis upon which awards will be granted will effect a revival of the craft spirit among youth. It will recognize and give social prestige to members who have produced distinctive work in any field.

The membership of the executive committee is representative of the well-known men in the industrial-arts fields. Other well-known men are members of the special committee appointed by the president of the American Vocational Association.

SUMMER CONFERENCE

On August 3 to 7, inclusive, the Industrial Arts and Trade and Industrial Education teachers of the states of Washington and Oregon met in joint conference at Long Beach, Washington, under the direction of Mr. O. D. Adams, Director of Vocational Education, Oregon, Mr. J. W. Kelly, State Supervisor of Industrial Education, Washington, and the Washington Industrial Education Association.

There were prominent speakers from both states, and the problems of Industrial Education were thoroughly discussed. The annual meeting of the Washington Industrial Education Association was held at this time, and officers nominated for the coming year; the elections to take place at the regular fall regional meetings, held in connection with the various W.E.A. regional conventions. The nominees were: Mr. E. P. Fait, Everett, president; Mr. Arnold H. Drews, Everett, secretary-treasurer; Mr. C. A. Steelsmith, Walla Walla, vice-president; Mr. E. J. Griffen, Spokane, President; Mr. E. E. Green, Spokane, secretary-treasurer; Mr. C. O. Rayl, Aberdeen, vice-president.

Nearly all of the teachers at the conference

(Continued on page 11A)

"Oliver"

METAL
Spinning Lathes

Supervisors of metal working shops in trade schools, high schools and universities should carefully consider the unlimited scope of work the metal spinning lathe opens to them and their students. Opportunities to give more thorough instruction to students, to develop more skilled metal workers.

"OLIVER" Spinning Lathes embody every advanced feature known to our engineers who have designed and built lathes of every type, large and small, for 44 years. 'OLIVER" Spinning Lathes prove themselves the best-engineered of their type on the market .... rigid, vibrationless, accurate, easy and safe to operate. They have large, heavy bearings of the finest type and are precision-built to give years of accurate, trouble-free service. They're mighty efficient at spinning sheet steel, copper, bronze, brass, aluminum, German silver galvanized iron, pewter, etc.

Write for Catalog

Oliver Machinery Co.
Grand Rapids, Michigan

The complete line of "Oliver" machines adapted to your needs includes: Planers, Saw Benches, Hollow Chisel Mortisers, Sanders, Band Saws, Grinders, Surfacers, Boring Machines, Jig Saws, Wood Trimmers, Vises, etc.

(Continued from page 362)

brought their families, and a very enjoyable sports and recreational program was combined with the educational. — *Arnold H. Drews.*

New Publications

Elementary Principles of Diesel-Engine Construction

By Members of Teaching Staff, Mechanics' Institute, Boys' Technical High School, Milwaukee, Wis. Cloth, 6 by 9, illustrated, 125 pages. Price, $1.80. Published by The Bruce Publishing Company, Milwaukee, Wis.

The ever-increasing interest shown in the Diesel engine, makes a book like this particularly valuable and timely.

The material contained in this book has been thoroughly tried out in the classroom. A number of men have collaborated in its production and among them are men who know the Diesel engine both practically and theoretically.

Besides a historical survey of the development of the heat engine, the book describes: Diesel combustion methods, fuel injection systems, starting methods, auxiliary equipment, modern Diesel developments, fuels and lubricants used, methods of engine power determinations, and examples of Diesel power applications.

Electric Wiring

By A. A. Schuler. Cloth, 387 pages, 5¼ by 7¾, illustrated. Price, $2.50. Published by the McGraw-Hill Book Company, New York City, N. Y.

This is a revised edition of a book designed especially for vocational training of electricians. The author has divided the subject of wiring into nine units, each of which is then subdivided into jobs. The book is well illustrated. Each job is accompanied by a number of questions which the student must answer after doing the assigned practical work.

Science in the World of Work — II

By Frank R. Deming and Joseph T. Nerden. Cloth, 282 pages, 5¾ by 8½, illustrated. Price, $1.48. Published by the McGraw-Hill Book Company, New York City, N. Y.

This second volume treats of density, heat, properties of liquids, properties of gases, sources of power and light, useful chemical facts, and sound, useful electrical facts. The chapters and units in this book are divided in the same manner as those described in Book I.

Elementary Photography

By C. B. Neblette, Frederick W. Brehm, and Everett L. Priest. Cloth, 253 pages, 5¾ by 8, illustrated. Price, 72 cents. Published by the Macmillan Company, New York City.

A book on elementary photography which may be used for curricular or extracurricular purposes. It is written so that it also may be used for self-instruction. It is divided into five units. The first one being an introduction to photographic practices; the second containing a description of the camera; the third, showing how negatives are made; the fourth, describing the making of prints, enlargements, and lantern slides; the fifth, containing a description for taking pictures at home, at school, at night, and photographing with the microscope.

Linoleum Block Printing for Amateurs

By Charlotte D. Bone. Cloth, 99 pages, 5 by 7½, illustrated. Price, $1. Published by The Beacon Press, Boston, Mass.

One of the Beacon Handicraft Series. The author has succeeded in giving a very simple explanation of the whole process, from cutting the block to the final printing. Each step is fully illustrated and explained. Printing in color and textile printing is described.

How to Draw Children

By Bernice Oehler. Cloth, 8½ by 11¼, 68 pages, illustrated. Price, $2.50. Published by Bridgman Publishers, Inc., Pelham, New York.

This book of interesting sketches of children gives brief and clever hints on how to draw the childish figure and how to put into the sketches life and the spirit of childhood.

School-Shop Equipment News

A HANDY HAND ROUTER

Kraut and Donahl, Inc., 325 South Clark Street, Chicago, Ill., are marketing a remarkably efficient little hand router. With this almost insignificant-looking tool, a variety of operations are possible. For instance, grooves of various sizes and shapes for inlay work may be cut with little exertion. The same cutter that cuts the groove may also be used to cut a strip of inlay filler that will fit into the groove. Craftsmen who delight in working

(Continued on page 12A)

HOW TO BE OLD FASHIONED

THOUGH MODERN

We're sticking to our same old way of making ink, for fifty years experience has taught us that a finer ink than Higgins just can't be made. But since we're modern enough to keep seeking improvement—we redesigned the bottle. • You'll find the new Higgins bottle trimmer, more graceful—easier to cork and uncork with one hand. Moderns and conservatives alike are hailing it, for it's little touches like this, combined with the unchanging superiority of the ink, that makes Higgins the standard of the world.

CHAS. M. HIGGINS & CO., INC. • 271 NINTH STREET, BROOKLYN, N. Y.

HIGGINS

(Continued from page 11A)

on model boats, houses, and the like, will find this router very efficient for cutting different kinds of moldings.

The outfit is marketed in the form of a kit containing a number of different shaped cutters, also a compass bar which permits the router to be used for cutting circular grooves.

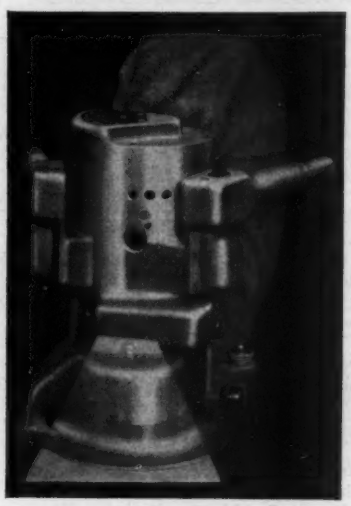
This interesting little tool is also useful in fluting spindles, and for linoleum and leathercraft work.

Full instructions for the use of the hand router accompany each kit.

ANNOUNCE NEW ROTARY FLOOR EDGER

The Porter-Cable Machine Company, Syracuse, N. Y., manufacturers of sanding equipment, have placed on the market a rotary floor edger, which is a new development in high-speed disk floor-edging machines.

The edger, which is portable, has a heavy-duty, universal, 1¼-h.p. motor, and a 7-in. diameter rubber combination pad to which paper- or cloth-backed abrasive disks may be applied. The machine is surrounded with an aluminum apron covering all but the sanding arc of the disk. It has two easy-grip handles mounted on the sides at a proper height to



New rotary floor edger

clear nosings when resurfacing stops. The machine has a polished aluminum frame, a hardened-steel, chrome-plated guard surrounding the revolving disk, and a floodlight for illuminating the working surface.

ANNOUNCE NEW STANLEY SOLDERING IRONS

A new line of electric soldering irons, the result of several years of extensive research, have been announced by the Stanley Rule & Level Company, New Britain, Conn.

These soldering irons are of improved design, operate efficiently and economically on either a.c. or d.c. current. They are correctly proportioned, well balanced, adjustable, and are equipped with removable handles. These tools are provided with hermetically sealed heating heads to protect the "built-in" windings and copper cores from air, fumes, and moisture.

Stanley soldering iron

Stanley soldering irons are manufactured in eight different sizes, ranging from 52 watts and 7/16-in. tip to 435 watts and 1 9/16-in. tip. Each iron is equipped with a 6-ft. flexible heating cord and a metal resting stand.

NEW LUFKIN TELESCOPING GAUGE

The Lufkin Rule Company, Saginaw, Mich., has announced its new No. 79AA telescoping gauge, which meets a real need for a telescoping gauge measuring under ½ in. The new gauge has a measuring range of 5/16 to ½ in.

The Lufkin telescoping gauge has a handle which can be locked in the center of the

(Continued on page 15A)

KEWAUNEE Vocational Furniture SAVES Space

Increases Student Capacity of Classrooms-Pedagogically Right

Art Table No. L-2081

Ever-Hold Steel Stool No. 518-24

Combination Padlock No. K-46A

Metal Worker's Table No. N-3151

Ever-Hold Steel Stool No. 618-24

If you have crowded classrooms, chances are you need to make changes in furniture. The first thing to do is write Kewaunee, explain your problem and, without charge to you, a Kewaunee Engineer will advise whether or not changes can solve your crowded classroom problem, and what changes may be needed. If you decide to refurnish your classrooms, he will be at your service to show you what furniture is best for your purpose and how it should be installed for maximum results. This service is provided without cost or obligation to you. Write us today.

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LABORATORY FURNITURE EXPERTS

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245 Lincoln St., Kewaunee, Wis.
Eastern Branch: 220 E. 42nd St., New York, N. Y.
Mid-West Office: 1614 Monroe St., Evanston, Ill.
Representatives in Principal Cities

Single Manual Training Bench No. N-3088

Glue and Stain Bench No. N-3154

(Continued from page 12A)

plunger, a distinctive feature in the larger gauges, which makes it possible to preserve perfect balance. It allows the tool to enter easily and it is adaptable for use in small and slotted openings.

The new gauge is an addition to the popular Lufkin line of telescoping gauges previously offered in a range running from ½ to 6 in. The firm also markets these gauges in sets, covering the entire range, 5/16 to 6 in.

Lufkin precision-tool catalog No. 7 can be obtained by anyone interested.

ISSUE NEW CATALOG OF HARD-TO-GET MATERIALS

The Thurston Supply Company, Anoka, Minn., has issued its twenty-second annual catalog, listing its "hard-to-get" materials for 1936–37.

The catalog lists upholstery supplies, mirrors, picture moldings, dowels, electrical equipment, decalcomania transfers, clock movements, inlay panels, chair-caning material, art-fiber-weaving supplies, cedar-chest trimmings, and furniture supplies, in addition to a line of varnish, glue, stain, enamel, cabinet hardware, furniture trimming, table tops, and materials for venetian blinds.

A copy of the catalog will be sent to any shop instructor upon request.

NEW STANLEY TOOL CATALOG

The Stanley Rule & Level Company, New Britain, Conn., has just issued its new Catalog No. 34A, containing 204 pages of descriptive matter on tools for carpenters and mechanics. Besides a large line of tools, this firm also manufactures a complete line of wrought-steel hardware, butts and hinges, garage hardware, storm sash and screen hardware, box strapping, shelf brackets, cold-rolled steel, and wrought-steel specialties.

The Stanley Company has been engaged in the designing and manufacture of carpenter tools since 1857, and the Stanley plane today is an outstanding achievement in fine tool design and manufacture.

A copy of the catalog will be sent to any school-shop instructor upon request.

News Notes

Vocational Training for Deaf Pupils

For the first time this year, deaf and hard-of-hearing pupils in Chicago are being offered vocational training in a high school, under the direction of a trained teacher of the deaf. The classes which have been established in the Washburne Continuation School, will offer instruction in English, lip reading, and essentials of arithmetic. Pupils may pursue a straight high-school course, with special coaching, or they may take a combination. In this way, such pupils are able to remain in high-school classes for children of normal hearing. The same plan is being followed at Lane Technical High School, where twenty boys, most of them graduates of the Bell School, will be taught.

Under the plan formerly followed at the Parker School, a teacher devoted most of her time to coaching hard-of-hearing pupils in regular high-school courses. This year a full-time teacher has been placed in charge of these classes.

Farm-Shop Course in High School

A new farm-shop course has been established in the high school at Chester, Ill. The course, which is in charge of Mr. E. J. Dunphy, will teach such phases of the subject as forge work, harness repair, operation of farm machinery, rope work, and gasoline-engine operation. It is planned to add another course in advanced livestock study.

Detroit Vocational Department Occupies New Offices

The offices of the vocational education staff of the public schools of Detroit, Mich., have been moved from the Roosevelt School to a new location in a remodeled apartment building opposite the Wayne University. The building was recently purchased by the school board and converted into offices for the department.

New Vocational Publicity Staff

The school publicity staff of the Detroit Bulletin, Detroit, Mich., has been increased with the addition of three members. Mr. Harvey Smith will report on news from the Fordson School in Dearborn; Mr. Russell Brumbaugh for the Hamtramck schools; and Mr. Ernest Gardner will cover the Highland Park and Detroit areas.

Detroit Placement Office Expands

The Department of Guidance and Placement of the public schools of Detroit, Mich., has announced an extension of the junior placement service of the downtown office. The new service covers the placement of applicants from 21 to 24 years of age who are

(Continued on page 17A)

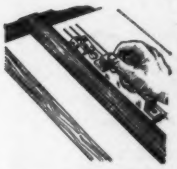
NECESSITY

for Wood-Linoleum-Leather

The fact that the U. S. Government allowed this patent proves that it is a NEW idea for doing inlaying quickly. Tedious tasks that formerly took hours with a knife or a chisel can now be done in a few minutes with this K & D hand routing kit.

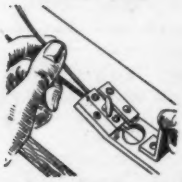
—INLAY—Not only does this hand router cut the inlay groove, it also does the more difficult part of the inlaying—cuts an IDENTICAL wedge or filler to fit the groove.

So Easy a Child Can Do It



Straight lines, are the easiest to cut with the hand router. The tool lies flat like a plane. Its straight sides are easily guided along a straight-edge. It cuts irregular curves by just following the design. It cuts perfect circles or segments by use of the compass bar.

Adjustment for deep or shallow cuts is made by raising or lowering the cutter. As it is lowered toward the handle the cut becomes deeper. When it is raised the cut is shallow.



In making inlays, if desired, the strip that is removed may be stained and replaced.

CRAFTSMEN find the Compass Bar a handy gauge for reeding and fluting spindles with the router.

Mouldings for model houses are easy to make with the router. The strips removed can be glued alongside of the rout and built up in various ways. A large variety of picture frames may be made in this same way.

TEN-DAY FREE TRIAL

Use this coupon

KRAUT & DOHNAL, INC.,

325 S. Clark St., Dept. I, Chicago, Ill.

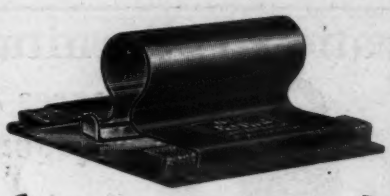
I enclose money order for two dollars. Send me a K&D Hand Routing Kit including the router, compass bar, three cutters, screw driver and emery cloth. I will try it ten days and if for any reason I am not satisfied, I will return it to you and you will return my money.

NAME

ADDRESS

CITY STATE

Check here ☐ if interested in ship model parts.



Red Devil

SANDPAPER HOLDER

Good Sand and Emery Paper Holders have long been needed in school wood and metal working shops. The Red Devil Holder takes Red Devil Handy Pack Paper or standard sheets cut in quarters. Here is a 25c tool that no school can afford to do without. We also have many other low priced Red Devil tools that you need—all sold through supply dealers. Send for our catalog.

LANDON P. SMITH, Inc.

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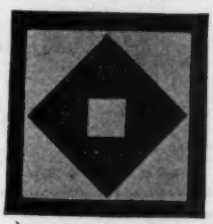
GLASS CUTTERS · GLAZIERS POINTS · GLASS PLIERS
PUTTY KNIVES · WOOD SCRAPERS · LAWN SPRINKLERS



NO COURSE IN WOODWORKING IS COMPLETE WITHOUT INSTRUCTION IN THE ART OF INLAYING, VENEER MATCHING AND TAPING.

We carry the largest stock and assortment of inlaid woods of any firm in the business. IMMEDIATE DELIVERY.

INLAID BORDERS: OVERLAYS (INSERTS), INLAID VENEERS, TABLE TOPS, MATCHED VENEERS AND PANELS, PICTURE PLAQUES AND INLAID TRAYS AND NOVELTY FURNITURE.

CATALOGUE CONTAINING CLEAR, LARGE CUTS OF INSERTS 25 cts.

50 STRIPS OF ACTUAL MARQUETERIE BORDERS 25 cts.

CAN YOU DISTINGUISH WOODS?
20 samples of rare woods, labeled as to name and source $1.

MARQUETERIE COMPANY

190 Lexington Avenue New York City

MODEL BOATS FOR JUNIORS

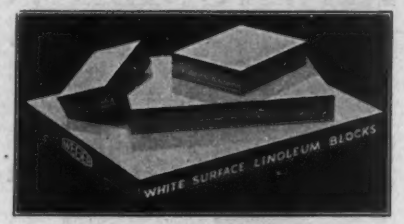
By Claude W. Horst

Here are clever, perfectly designed, "true-to-life" models, many of which are equipped with their own power plants. Prepared especially for beginners, the work is arranged according to building difficulty and every step in the construction is made simple and clear. $2.00

The Bruce Publishing Co.

New York Milwaukee Chicago

A WHITE SURFACE



LINOLEUM BLOCK

ELIMINATES DRAWING IN REVERSE
Sketches may be drawn positive with a soft lead pencil on tracing paper and then rubbed off on to the "White-Surface" by laying the drawing face down on the block and rubbing the back of the drawing with some smooth round object like the back of a spoon.

FINE DETAIL OBTAINABLE
The sharp color contrast between the "White-Surface" and underlying dark linoleum provides for the following of minute detail in cutting.

HARD, RIGID PRINTING SURFACE
Conveys clear, clean-cut printing edges. Deep gouging is unnecessary.

Block Printing Inks - Cutting Knives and Pens
Catalogue on request.

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Drawing Materials Manufacturing Artists' Colormen Since 1853
Studio School and Drafting Room Furniture

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SEMI FINISHED flat type creamy white hickory staves—tapered to shape, surfaced all sides, narrow cut out grip with black walnut built up grip glued on.
Special at only $1.00 each.
ARROWS—$2.50 per dozen. Finest spruce shafts, brass piles tips aluminum arrow nocks.
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HOLD-HEET

Out-sells all other makes 2 to 1.
Offers 14 other feature advantages.
Built for 20 years of perfect service.
Operates at an Amazingly Low Cost.

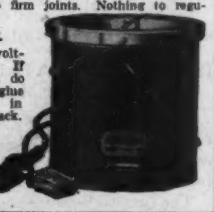
1 qt.-	$14
2 qt.-	$17
4 qt.-	$24
8 qt.-	$36

Specify 110-220 Volts

Hold-Heet Glue Pots heat quickly to correct temperature — automatically. Economical for current. Accurate to 1 degree, they insure firm joints. Nothing to regulate or forget.

30 DAYS FREE TRIAL

Tell us the size and voltage you want for test. If after 30 days trial you do not find it the finest glue pot you've ever used in every respect, send it back.



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Russell Electric Company
364 West Huron Street
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PAXTON LUMBER *and* PLYWOOD

Write for 1936-37 Catalog

FRANK PAXTON LUMBER CO.

Kansas City, Kansas Denver, Colorado

"SON, WHY DO YOU LIKE INDUSTRIAL ARTS?"

"Gee, Dad, we can make things ourselves. We've got a shop library of books where we can look up anything we need to know. That's more fun than studying something just because you're told to.

"We've got stores-keepers, foremen, and toolroom men just like a regular shop. Some kids are better at some jobs than at others. Still, some of the slow boys do awfully good work. Fellows who are on the machines have lots more things to take home than the younger kids who are only on hand tools."

"That's right, Son. Efficient production is still, and always will be, the basis of effective distribution. That's a fine lesson to learn in school. I think I like Industrial Arts, too, my boy."

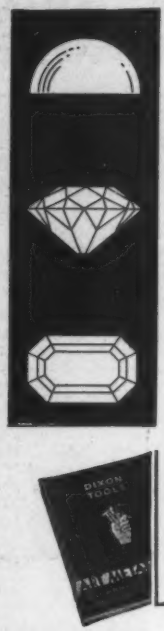
Write us today for books and pamphlets on:

Air Conditioning; Architecture; Automobile; Aviation; Carpentry; Diesel Engines; Drafting; Electricity; Forging; Foundry; Jigs and Fixtures; Machine Shop; Pattern Making; Plumbing; Printing; Radio; Reading Shop Blueprints; Refrigeration; Sheet Metal; Service Station Salesmanship; Tool Making; Welding.

Catalog on request. Books and pamphlets on approval.

INTERNATIONAL TEXTBOOK CO.

Box 8906-F Scranton, Penna.



LAPIDARY-As Old As Civilization But To-days Newest Craft

Lapidary as an art craft is new today because only recently have machines been perfected that meet the requirements of student lapidists.

Dixon now offers practical Lapidary Machines for the classroom. In their construction is combined the united effort of educator and lapidist.

Lapidary combines educational features not found in other crafts. It not only combines manual and art training but creates incentive and greatly aids the study of geology. It enables metalcraft students to grind and polish their own stones for mounting in jewelry.

Write for our interesting brochure on this new craft—just published.

WILLIAM DIXON INCORPORATED
34 E. Kinney St., Newark, N.J.

DIXON LAPIDARY MACHINES

(Continued from page 15A)

without working experience. The placement of boys and girls between the ages of 16 and 21 will be continued as in the past. Five new placement workers have been added to the present staff, who will participate in personnel and training work in the field.

Short Courses for Teachers

The A. and M. College, of Stillwater, Okla., in co-operation with the Oklahoma Department of Vocational Education, is sponsoring a number of short courses for teachers of evening classes in industrial education. Similar courses have previously been offered for teachers of firemen, waterworks employees, oil-field workers, and school custodians. A number of extension teacher-education courses are also being offered, which afford individuals opportunity to obtain credits toward bachelor or master degrees. The courses stress the function and place of vocational education in the public schools and emphasize the importance of keeping teaching content up to date.

Tuskegee Faculty Member Gives Talk

Mr. George L. Washington, director of industries in the Tuskegee Normal and Industrial Institute, Tuskegee Institute, Ala., gave a talk before the Columbus Rotary Club, on August 3, on the topic, "Tuskegee and the Skilled Negro." On Wednesday, August 5, he gave an interview of thirty minutes over station WOSU concerning his work at Tuskegee.

Vocational Courses Win Recognition

The Vocational High School at Toledo, Ohio, recently received recognition in the February issue of *Iron Age*, a national magazine, because of its efforts to train employees for better jobs and its success in supplying skilled workmen. The Toledo Vocational High School teaches seventeen different trades, 21 allied subjects, and many general high-school courses. The special activities of the staff comprise the promotion of hobby shows and foremen's training. Mr. F. M. Dannenfelser is principal of the school.

Announce New Department

The School of Vocational Education of Clemson Agricultural College, Clemson College, S. C., has announced the establishment of a department of rural educational research, to be operated in co-operation with the General Education Board. Dr. Henry L. Fulmer, formerly director of the division of research of the state department of education, has been appointed as head of the department.

Fisher-Body Craftsman's Guild Winners

William A. Fisher, president of the Fisher-Body Craftsman's Guild, recently announced the four winners of the 1936 master-class model coach-building competition at the sixth award dinner of the General-Motors-sponsored educational foundation. The dinner was held in the auditorium of Cleveland College, of the Western Reserve University.

The judging of the designs was in charge of an international board of judges, comprising Carroll R. Reed, Minneapolis, Minn.; Frank Cody, Detroit, Mich.; Walter Leuschner; W. S. McLean; Rev. T. A. Steiner, University of Notre Dame; M. L. Brittain, Atlanta, Ga.; E. A. Hitchcock, Ohio State University; P. K. Kolbe, Drexel Institute; H. V. Carpenter, State College of Washington; Frank Riess; W. A. Fisher; Daniel Carter Beard; R. L. Sackett; Laurence J. Young; N. R. Crozier, Dallas, Tex.

The winners in the contest were Henry B. Larzelere, 19, Flint, Mich.; Ralph Kyllonen, 16, Monessen, Pa.; John H. Doney, 16, Seattle, Wash.; Ralph Schreiber, 18, Faribault, Minn. Each of these boys received a $5,000 scholarship as a result of his efforts in constructing a miniature Napoleonic coach.

New Film Catalog

The H. W. Wilson Company, New York City, has announced the publication of an Educational Film Catalog, which lists 1,000 films. It provides information on manufacturers of films, whether the film is to be purchased outright or rented, and the charges for transportation. A plan has been evolved for grading all films suitable for classroom use.

Information may be obtained by writing to the H. W. Wilson Co., 950 University Ave., New York City, New York.

The Langley Printer

The Langley Printer, is the name of the official graphic-arts magazine for the Langley Junior High School, in Washington, D. C. The paper has an editorial staff of six, and prints a variety of news concerning printing in the schools.

New Catalog of Tests and Scales

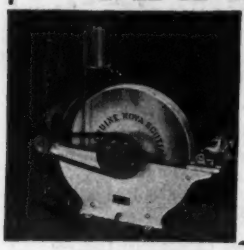
The University of Minnesota Press, Minneapolis, Minn., has issued its latest catalog, listing its line of tests and scales in education, psychology, sociology, and home economics. The tests represent both new and old publications.

Mechanical Drawing News

A new magazine, *Mechanical Drawing News*, is being published by the Mechanical Drawing Association of New England. The paper is edited by William Bettencourt, of Belmont, Mass., and the editorial office is in the Belmont High School. The paper contains articles on drafting, news notes, and announcements concerning meetings of associations.

The School Shop Shopping Guide

SHARP TOOLS



WET TOOL GRINDERS

A Wet Tool Grinder especially designed for School Shops, duplicating on a small scale, the conditions and technique used by the manufacturers of fine tools and cutlery. Patented Tool Holder insures perfect bevels and edges. Price without motor—$18.00 delivered in the U. S. Larger floor machine available.

AUTOMATIC OILSTONE

New device makes easy accurate bevels and perfect edges. Coarse and fine in one reversible oilstone; micrometer adjustment. No moving parts — nothing to wear out. Price $4.85 postpaid. Both machines sent anywhere in the U. S. on approval.

Write for descriptive folders.

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100 Middlesex Avenue — Somerville, Mass.

Will Your Boat Leak?

Avoid leaks by using the right marine glues when building your new boat. There is one best glue for each particular purpose.

FERDICO-JEFFERY MARINE GLUES

have been used more than 90 years in building and repairing boats. If you have a glue problem, write us. We have helped thousands.

Write to Dept. XL for free folder: "How to Repair Leaks."

L.W. Ferdinand & Co.
599 Albany Street — *Boston, Mass.*

30 DIFFERENT TYPES
of HARTFORD CLAMPS

Clamp Fixtures of Malleable Iron for making up your own bar clamps can now be purchased to fit any ordinary ¾" pipe. No tools required.

Work will not buckle with double bar clamp. *Catalog Free*

Hartford Clamp Co. Burnside, Conn.

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WILDER LEATHER CHICAGO

for the Classroom or Shop is simplified by the use of

WILDERCRAFT INSTRUCTION SHEETS

Give the students full directions for decorating and constructing leather articles. A copy free on request. Also a price list of craft leathers, laces, modeling and stamping tools, splitting and veining tools, snaps and snap-setting tools, "Quickwork" Lacing Punches and lacing needles, dyes, etc.

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MODELLING AND POTTERY
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in all quantities

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Catalog Upon Request

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TO SUPERVISORS AND SHOP INSTRUCTORS

You save money on your tool purchases when you buy Snap-on-Blue-Point equipment. Write for new 120 page catalogue and information on special school shop service. We shall be privileged to be of service to you.

Manufacturers of

Snap-on Socket Wrenches AND **Blue-Point** Mechanic Tools

SNAP-ON TOOLS, Inc.
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The Bemis Standard

A Manual Training Bench that stands the test of time

Details on request

A. L. BEMIS 68 Commercial St. Worcester, Mass.

NEW *Inexpensive* PRECISION GRINDER

The New 44 Lathe Grinder was introduced to bring the features of the larger, more costly Dumore tools within the reach of school shops. Hundreds of jobs never before possible on small lathes can be handled by the No. 44. Write today for complete information.

THE DUMORE CO.
Racine, Wisconsin

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The Gem of Modern Plastics
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Best of the Cast Resins
Ideal for your class projects
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Box 321 V — SCOTCH PLAINS, N. J.

Materials for Brush Making

Brush Fibres, Tampico, Fibre Mixtures, Sterilised Horse Hair. Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*

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Crackle—Wrinkle—Silver and Special Paints

Write for information on complete line.

We supply any type of special finish to order.

CAMPBELL PAINT SPECIALTIES CO.
Ann Arbor, Michigan Dept. 6

Quiet—Noiseless—Sturdy
Low—Efficient

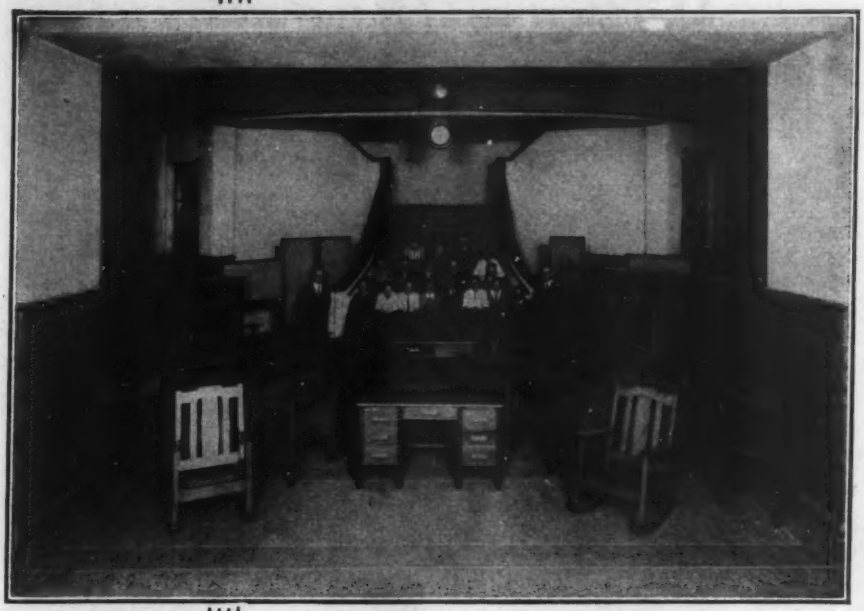
The American Low Boy is an all 'round maintenance machine. On all kinds of floors it SCRUBS — POLISHES — DISC SANDS — BUFFS — WAXES and STEEL WOOLS all with a maximum of efficiency and quietness.

The American Low Boy gets under low furniture with ease. It is only 4½" high!

Write for full information.

The American Floor Surfacing Machine Co.
516 S. St. Clair St. — Toledo, Ohio

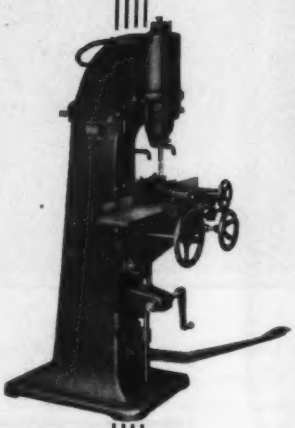
TEN YEARS AGO



The pieces shown in the photograph to the left were made by students at the vocational school in Battle Creek, Michigan in 1926, ten years ago.

Desks, typewriter desks, laboratory tables, rocking chairs, dictionary stands — all were constructed in the school shop under the direction of Mr. G. G. Price, Manual Training Director.

Today, the same "Oliver" machinery is doing satisfactory service.



"Oliver" mortisers are ideally suited for woodworking in school shops. They are scientifically designed for mortising up to full capacity with minimum of effort: handling of chisels is unusually simple, and the inbuilt motors are powerful enough to handle any woodworking job.

The leadership of the "Oliver" line and their acceptance by schoolmen is based upon satisfactory results from "Oliver" equipment in use in schools for ten or more years, thruout the country.

All "Oliver" machines are built to meet the exacting requirements of industry and the school shop. Irrespective of size or price all "Oliver" machines are built to the same high standard of quality. There are no differences in workmanship or material.

"Oliver" machines adapted to your needs include: saw benches, band saws, surfacers; lathes, sanders, boring machines, mortisers, wood trimmers, tool grinders, vises, and glue pots.

Send for your copy of the "Oliver" Catalog.

OLIVER MACHINERY CO.

Grand Rapids, Michigan

TEACH YOUR STUDENTS

"The Art of Making Blue-Prints"

★ **You can do it easily, conveniently and economically—with a Pease "Junior" Blue-Printing Equipment—right in a corner of your school drafting room.**

The Pease "Junior" Blue-Printing Equipment was especially designed for school use and will produce high grade reproductions, tracings. charts, diagrams and bulletins in any size up to 24x36".

It possesses real class room value because it enables students to actually serve an apprenticeship on standard commercial equipment and gain a useful, practical blue-printing experience right along with their studies.

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Please send me complete facts and prices on the "Junior" Blue-Printing Equipment.

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SURFACES PANELS UP TO 30" WIDE!

NEW SERIES
900 UNIVERSAL
BELT & DISC SURFACER
BY
WALKER-TURNER

AT THE SAN ANTONIO CONVENTION

Don't miss Walker-Turner exhibits, booths 17, 18, 19, Gunter Hotel. Many new and interesting things to see.

THIS engineered machine combines all three methods of surfacing — belt, disc, and "stroke" sanding of large areas — and handles wood, metal, plastics, fibre, bone, cork and countless other materials with amazing ease and speed.

Belt unit may be shifted from horizontal to vertical position in a few seconds. Disc table is adjustable. There is a big table under the upper belt surface for belt sanding, and panels of any length, up to 30" wide, may be surfaced under the lower belt.

Then consider the quality features! Powerful ½ h.p. motor. 4 SKF dust-sealed ball bearings. Belt, 4" x 64½" and 10" disc are aluminous oxide coated. Four speeds. Disc and belt pulleys perfectly balanced.

But these are only a few of the many facts that will make you want one of these brand new Universal Surfacers for your own shop. Get the whole story in our catalog, "Walker-Turner Tools For The School Shop", sent free. Walker-Turner Co., Inc., 19126 Berckman Street, Plainfield, N. J.

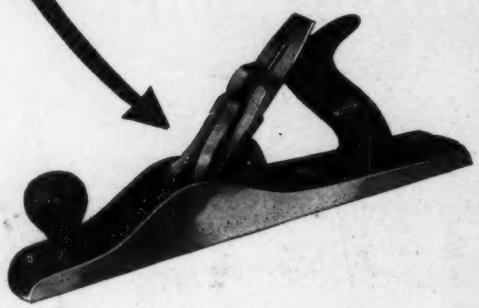
Walker-Turner builds three complete lines of engineered Bench Saws, Band Saws, Jig Saws, Jointers, Drill Presses, Lathes, Flexible Shafts and Motor Grinders.

WALKER-TURNER *Engineered* POWER TOOLS

An Improved Lever Cap

For

STANLEY "BAILEY" PLANES



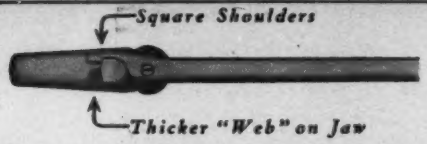
Notice the pear-shaped hole in this improved lever cap. The lever cap screw fits snugly in the smaller hole and overcomes any tendency of the lever cap to back up or loosen when the cutter is adjusted.

Stanley "Bailey" Planes are constantly being improved making them the standard of carpenters, cabinet makers, shop instructors and home craftsmen, everywhere. You, too, will find Stanley "Bailey" Planes superior in performance for all jobs that require a bench plane.

The 1936 edition of the No. 34-A Stanley Tool Catalog is a convenient sized reference book for hand tools. Write for your copy now —with the School Index—to have it handy for ordering new tools and repair parts.

STANLEY TOOLS

Educational Department
New Britain, Connecticut



NEW design! Square shoulders on jaw shank provide positive bearing against working stress — permit thicker, stronger "web" without increasing head thickness. New materials add to the strength that make both Williams' Adjustable (Carbon-Steel) Wrenches and Williams' "SUPERJUSTABLE" (Chrome-Alloy) Wrenches great shop tools.

Adjustable Wrenches are *drop-forged* from special, strong, tough steel — accurately *heat-treated* for uniform strength. Two styles of finish; Polished all over and, at lower price, semi-finished — gray, with heads bright.

Williams' "SUPERJUSTABLE" Wrenches embody same design features and size range, but are forged from Chrome-Alloy steel, heat-treated and chrome-plated with heads buffed bright.

Five sizes in each line; 4, 6, 8, 10 and 12".

Write for Catalog "E" of fully guaranteed tools and shop specialties. Sold by mill supply and industrial goods distributors everywhere.

J. H. WILLIAMS & CO.
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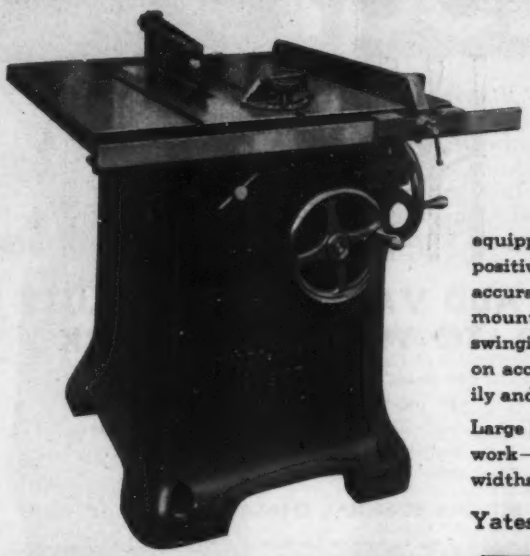
Headquarters for: Drop-Forged Wrenches, (Carbon and Alloy) Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs and Vises, etc., etc.

WILLIAMS
SUPERIOR DROP-FORGED TOOLS

HELPS STUDENTS ADVANCE



Shop students who use Yates-American school machines enjoy many distinct and practical advantages. Safe, modern in design, easy-to-handle, affording maximum student participation, they enable young craftsmen to advance rapidly in their work.

The G-87 Saw, shown here, offers greater safety, accuracy and capacity. Adjustments are easy to make. . . controls are conveniently located in full view. A splitter-type guard equipped with special kick-back fingers and aluminum cage provides positive protection. Advanced design and careful construction assure accuracy on all types of work. For example, the rotor of the motor is mounted directly on the saw arbor, eliminating gears and belts . . . the swinging frame carrying the saw arbor and motor units is mounted on accurately machined ways, forming a firm support which tilts easily and retains perfect alignment.

Large in capacity, this machine will handle even the most advanced work—stock 20" wide can be ripped to the right of the saw—14½" widths can be cut-off. Write today for complete information.

Yates American Machine Company Beloit, Wisconsin

G-87 TILTING ARBOR VARIETY SAW

YATES-AMERICAN

SPECIFY

MORGAN Mechanical and Woodworking Vises

Adjustable Steel Handle—Stop in Front Jaw Wood Handle Furnished if desired. Furnished with or without stop in front jaw. Faces drilled for installation of wood faces.

CONTINUOUS SCREW PARALLEL VISE BAR

VISE NO.	WIDTH OF JAW, INCHES
210A	7
213A	8
220A	10

SPECIFY "MORGAN"

They don't cost any more. Are unsurpassed for strength, rigidity and durability. Guaranteed against breakage. Parts broken in service replaced free of charge. Special machining allows interchangeability of all parts when through wear it becomes necessary to replace parts.

Swivel Base Machinists Vise

Unsurpassed for strength and durability. Both stationary and swivel base styles, ranging from 3" to 7".

We will gladly quote on your requirements or send illustrative material upon your suggestion to do so.

WRITE

MORGAN VISE COMPANY

120 N. Jefferson St. Chicago, Ill.

Certainly. Send details!

about the **TAKE-ABOUT Sander**

that—1. Advances the standard of Manual Training work by inspiring students to do a better job.

2. Saves its cost many times over by refinishing desks, seats, blackboards, etc. at a few cents each.

A Demonstration Will Prove

. . . that the Take-About Sander by eliminating hand sanding will allow more time for supervision and instruction.

. . . that the Take-About produces an expert finish on either curved or flat sufaces.

. . . that the Take-About is faster than 10 pairs of hands.

. . . that practical instruction and preparation for a position in industry requires the use of a Take-About Sander.

So . . . just say, "Certainly, send details."

See our display. Booth 56 at the A. V. A. Convention, San Antonio, Tex.

The PORTER-CABLE MACHINE COMPANY

PRECISION MACHINERY BUILDERS SINCE 1906

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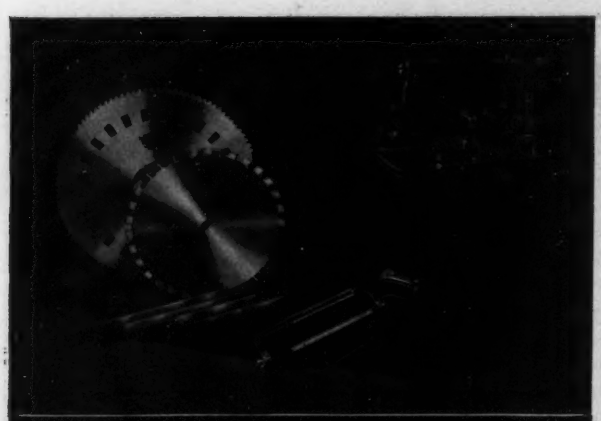


ATKINS METAL CUTTING SAWS

PERFECTION . . .

. . . is guaranteed because these Silver Steel Saws are:

. . . Uniformly tempered.

. . . Accurately balanced.

. . . Perfect in every detail.

. . . Made by Atkins-trained saw craftsmen with complete modern equipment at their disposal.

It pays to train youth in the use of fine tools. It pays to equip your department with fine tools. Atkins Silver Steel Saws are not only fine saws, but they give you extra dollars and cents value. Specify Atkins on your requisitions. E. C. Atkins and Company, 404 So. Illinois Street, Indianapolis, Indiana.

ATKINS

ATKINS *Silver Steel* SAWS

A FAMILY OF CHAMPIONS

CHASING TOOLS

ADD VARIETY AND BEAUTY TO YOUR METALWORK

40 Tools designed for School use. Made to our own specifications from Swedish Tool-steel. An enlarged choice of Tracers, Chasers, Matting and Decorating Tools is now available. Illustrated folder on request.

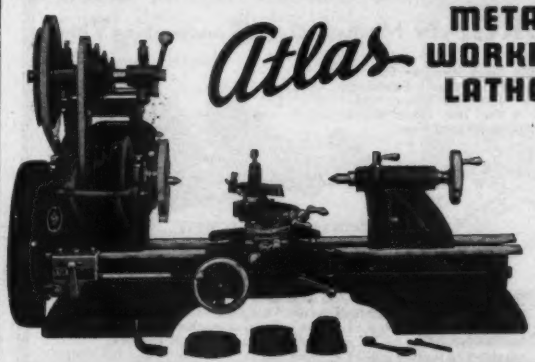
SET OF 8 ESSENTIAL CHASING TOOLS - $3.25

Ask for our Free Literature of Jobsheets, Tools and Materials for Wrought Iron and Beaten Metalwork.

THE WROT IRON DESIGNERS
541 West 35th Street New York, N. Y.

NEW! MODERN!

Atlas METAL WORKING LATHES



MODERN DESIGN-MODERN CONSTRUCTION

The new Atlas is an ideal metal lathe for the school shop—designed for accuracy and efficiency, and built to stand the wear of inexpert student use. In the popular model shown the Bed is 36" long. Has 10¼" swing, takes 18" between centers and may be fitted with attachments for all machine shop operations.

New Atlas metal lathes are priced from $37.50 to $112.50. "Better to have several low-priced lathes and give more students a chance," say many industrial teachers, "than one expensive model and a waiting line." New catalog of metal and wood lathes, drill presses, tools and attachments is now being printed. Reserve your copy now.

ATLAS PRESS COMPANY
1071 No. Pitcher St., KALAMAZOO, MICHIGAN

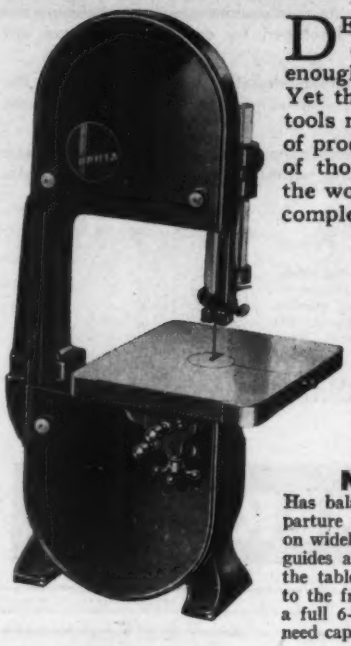
Complete displays at Chicago-35 E. Wacker Drive New York-130 W. 42nd St. Philadelphia-113 N. 3rd St.

FEATURES

Self-contained countershaft and universal motor bracket. Cuts 4 to 96 threads per inch. 16 speeds—28 to 2072 R. P. M. Heavy duty enclosed on-off switch. Automatic reversible power feeds. Threading dial. Graduated tailstock ram. Modern V-Belt drive. New cast iron gear guard, self-locking latch. Laminated shims throughout. New heavy compound rest. Well and pin for center lubricant.

ATLAS QUALITY

NEW LOW-COST TOOLS BY DELTA



DELTA offers a complete range of motor-driven tools for school shops. Prices are low enough to be well within the reach of all budgets. Yet the quality, sturdiness and accuracy of these tools make them ideal for the steady heavy grind of production work. Delta tools are in use in tens of thousands of shops, small and large, all over the world. Find out why. Send coupon below for complete 1937 catalog.

NEW 11-INCH DRILL PRESS

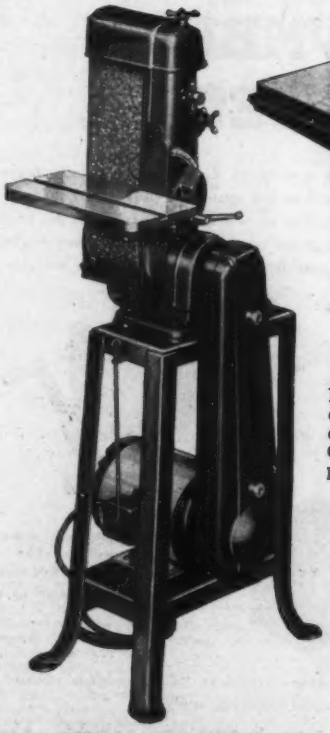
Built to the same standards of precision and accuracy as the 14-inch drill presses, this machine will drill, bore, shape, mortise, rout, sand, carve and grind just like the larger machines. Interchangeable spindles are available, with chuck equipment to suit any job. And it has all the engineered features of the larger machine—full-floating, ballbearing spindle and drive pulley, four speeds, tilting table with index pin, graduated quill and adjustable pointer, stop rod and all the other conveniences.

NEW 10-INCH BAND SAW

Has balanced enclosed disk wheels, running on New Departure double-seal ball bearings, patented table swinging on widely-spaced double trunnions, micrometer adjustment guides and ball-bearing blade supports above and below the table, with the lower-guide adjustments brought out to the front of the table for convenience and safety—and a full 6-inch capacity under the blade guide—where you need capacity in a band saw.

NEW 4-INCH JOINTER

It has the patented fence that insures sure, free action and unvarying accuracy of the settings patented swinging stop with its individually adjusted stop screws, swinging dual-control handle that makes control of the fence so convenient.

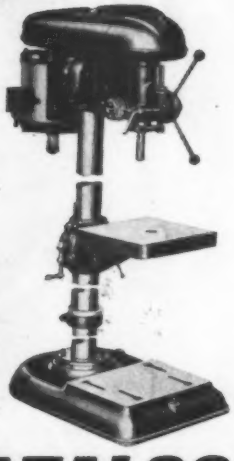


NEW 6-INCH BELT SANDER

Has numerous new features including complete double-sealed ball-bearing equipment, full 6 inches of sanding width. Operates in both vertical and horizontal positions.

NEW 17-IN. DRILL PRESS

The greatest drill press value ever offered. Has scores of unusual features. Get the full story in the 1937 Delta catalog.



SEND FOR THE 1937 DELTA CATALOG

DELTA MFG. CO.

600-634 E. Vienna Ave., Milwaukee, Wis.

IMPORTANT: Outside of the United States and its possessions, Delta Tools are known as "TAUCO" Tools. Tauco tools are identical in every respect to Delta Tools.

SEND FOR CATALOG

The 1937 Delta Catalog is yours for the asking. It is crammed from cover to cover with illustrations, facts, prices on the complete Delta line—including the many new tools and important changes.

DELTA MANUFACTURING CO. E 12-36
600-634 E. Vienna Ave., Milwaukee, Wis.

Please send me, without obligation, the 1937 Delta Catalog and any information you may have regarding use of Delta Tools in school shops.

Name.....

Address.....

School.....

W-30 DRILL PRESS

The superior quality of this machine is apparent at a glance . . . so is the striking originality and modern spirit of its design . . . yet the price for this superb tool is much lower than one might expect it to be. It incorporates many features found on no other machine—regardless of price.

Think of it! Two-column construction, offering unusual strength and rigidity . . . MULTISPEED drive, providing any desired speed from 800 to 4000 R.P.M. without shifting the motor or touching the belt . . . a built-in spindle lock which locks the spindle rigidly while opening and closing the chuck. All are exclusive Yates-American features—developed by engineers who have had years of experience in school machine design.

Consider also, the totally enclosed depth gauge, set without calculation and uncertainty . . . the 7⅜" bearing surface on the entire length of the quill, eliminating spindle chatter . . . and the heavy cast iron table ground to a true working surface.

The entire driving and operating mechanism is totally enclosed, a feature which not only prevents dust and dirt from entering the bearings and moving parts, but makes the machine unusually safe in the hands of even the most inexperienced student.

Mortising Easy To Do On This Drill Press

Your students can cut mortises quickly and easily with the mortising attachment illustrated. Cuts out corners perfectly square, insuring tight, accurate fit. Indispensable in cabinet making. Routing, carving, shaping, sanding, grinding and boring in wood with multispur bits are also entirely practical on this machine. Investigate its wide range of usefulness in your shop now. Write for catalog today!

YATES-AMERICAN MACHINE COMPANY
Beloit, Wisconsin

YATES-AMERICAN

HELP THESE HANDS

Young hands learn quickly. With careful training their first awkward fumblings soon change to deft, sure movements. Starrett Tools will make that change come easily and naturally—for Starrett Tools inspire precision. Their sure accuracy has made them the choice of skilled workmen in every trade.

The Starrett Educational Set will be a valuable aid in teaching your classes. Fourteen 8" x 10½" blue-printed pages, punched to fit a standard note book. Each page shows a different tool and tells how to use it. Furnished at cost —10 cents per set.

THE L. S. STARRETT CO.

World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy.

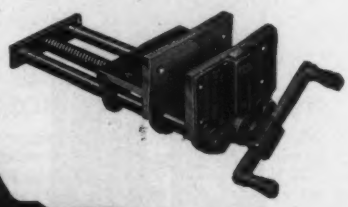
Athol, Mass., U. S. A.

Use Starrett Tools

COLUMBIAN VISES

In schools thruout the country, Columbian Vises have gained a merited reputation for quality. The high standard of materials and quality of workmanship that go into all Columbian Vises assure durability, efficiency—also economy, because they are designed for a lifetime of satisfactory service.

The "continuous screw" woodworkers' vise opposite is equipped with special all steel adjustable handle. Columbian also makes "rapid-acting" models.



Columbian machinists' vises are made of malleable iron — guaranteed unbreakable. Made in all standard sizes and styles

For information on the complete "Columbian" line of vises and clamps, write to

THE COLUMBIAN VISE & MFG. CO.
9017 Bessemer Ave. CLEVELAND, OHIO.